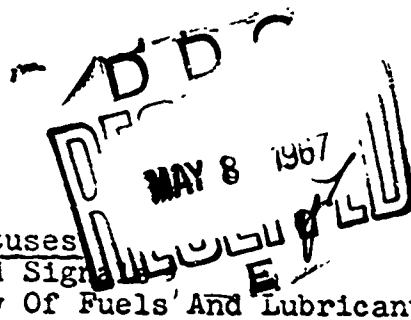


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On the first page of the cover is a photo taken by G. Omel'chuk.

On the fourth page of the cover is a drawing made by A. Medvedev for the article "Line Crossing Recorder".

On the insert is a photo composition by K. Kulichenko and V. Kunyayev, and a drawing by N. Suslov for the article "Checking The Quality Of Fuel And Lubricants".

To avoid ambiguity in the words used to indicate units, the following Russian words appear in trans-literated form in the translation:

podrazdeleniye - unit(s) from squad to battalion in size;

chast' - unit(s) equivalent to a regiment;

soyedineniye - unit(s) from brigade to corps in size.

STRENGTHEN THE BOND BETWEEN SCIENCE AND LABOR

(To the All-Union Council of Scientific-
Technical Societies of the USSR)

The Central Committee of the Communist Party of the Soviet Union, the Council of Ministers of the USSR, and the All-Union Central Council of Labor Unions warmly congratulate the All-Union Council of Scientific Technical Societies and through it all scientists, engineers, designers, technicians, agricultural specialists, and workers-innovators on the 100th Anniversary of scientific technical societies in our country.

Scientific technical societies have traveled a long and glorious path. Their history is closely tied to the development of Soviet science and technology. Among the founders and active members of scientific technical societies were the world famous scientists D. I. Mendeleev, A. S. Popov, D. K. Chernov, P. N. Yablochkov, and other prominent representatives of our Motherland's science.

After the victory of the Great October Socialist Revolution the development of science and technology in our country became one of the deciding factors in the mighty growth of productive forces. The Communist Party, the government, and labor unions show daily concern for creating the conditions necessary for fruitful activity by scientists and the engineer-technological intelligentsia and for developing the mass scientific-technical creativity of laborers. Great successes have been achieved in Soviet science and technology. Our country occupies leading positions in exploration of outer space, nuclear physics, electronics, radiotechnology, metallurgy, missile technology, aircraft building, and many other fields. During the Seven-Year Plan the tempo of scientific technological progress increased as did the introduction into the economy of the achievements in the fields of science and technology.

Scientific technical societies became a powerful force which contributed actively to the successes scored in domestic science and technological processes. They are making an important contribution to the technological rearmament of enterprises and different branches of the economy and they are cooperating in introducing the achievements of science and technology and leading experiences into industrial and agricultural production, mastering highly productive technological processes, and using the country's natural wealth. The Communist Party, the government, and all Soviet people value highly the creative labor of scientists and the engineer-technological intelligentsia and all innovators in production who work for the good of our socialist Motherland and for the sake of Communism's triumph.

The 23rd Congress of the CPSU assigned the mission of accomplishing in the next five years great forward movement by Soviet society along the path of Communist construction, further development of the material-technical base, strengthening the economic and defensive might of the country, and a large rise in the living standards of our people. The new Five-Year Plan is a five year plan of technological progress, all-round development, and application of the achievements of science and technology, growth in the productivity of labor, and increase in the effectiveness of public production.

In this connection, broad new horizons have been opened before scientific-technical societies. Uniting active fighters for progress in science and technology, they are called on to contribute in all possible ways to complete the tasks listed in the Five-Year Plan, especially with respect to the development of productive forces in regions of Siberia, the Far East, and Central Asia; to increase the productivity of labor in all branches of the economy, to master systematically the production of

technically new and improved goods, to increase quality, and to lower prime cost. The initiative and energy of organizations in these societies and the millions of specialists and workers-innovators must be directed toward accelerating scientific-technical progress; introducing the achievements of science, technology, and leading experience into production; and toward unconditional fulfillment of plans for new technology. It is necessary to attract on a wider scale the creative efforts of these societies to solving the problems of complex mechanization and automation of production, introducing a scientific organization of labor, and raising the cultural level of production. Particular attention of scientific-technical societies should be devoted to problems involving further improvement in planning and economic stimulations of production, improvement in the use of fixed assets, and timely introduction and mastery of the productive potential of enterprises. It is the duty of every scientific worker, designer, drafter, engineer, technician, agricultural specialist, and worker-innovator to make a personal, creative contribution to fulfilling the Five-Year Plan.

One important task of scientific-technical societies is to raise in all possible ways the level of technical and economic knowledge of engineers, technicians, other specialists, workers-innovators, and the masses of workers and to constantly publicize the achievements of science and technology and leading experience. It is necessary to develop and strengthen the business-like collaboration of organizations in these societies with government, economic, and planning organs and with scientific institutions. All organizational work of all societies must be permeated with a spirit of bold creative search and concern for strengthening the bond between science and production and attracting all engineer-technical intelligentsia and broad strata of workers and salaried employees to creative activity aimed at improving production.

The Central Committee of the Communist Party of the Soviet Union, the Council of Ministers of the USSR, and the All-Union Central Council of Trade Unions express their firm conviction that scientific-technical societies will become even more active in striving to develop Soviet science and technological progress in the economy and will mark the national holiday of the 50th Anniversary of Great October by new creative successes in the fight to fulfill the tasks involved in building Communism in our country.

Central Committee
of the CPSU

Council of Ministers
of the USSR

All-Union Council
of Trade Unions

BEGINNING THE JUBILEE YEAR

Created by the great Lenin and filled with inexhaustible energy, the Soviet government approaches the 50th Anniversary of the Great October Socialist Revolution, having opened a new era in the history of mankind -- the era of the fall of capitalism and ratification of Communism. The past year left in the minds of Soviet people and our friends abroad an indelible memory of the year as one of a prominent historical event -- the 23rd Congress of the CPSU. The congress demonstrated to all the world the vital force behind the idea of Marxism-Leninism. The decisions of the congress received the universal approval of the Party and the people and had a beneficial effect on all aspects of political, economic, and public life in our country.

Some of the results of the first year of the new Five-Year Plan give evidence that the increased role of economic methods in controlling the economy, the increase in material incentive of collectives of workers in productive enterprises and the growth in the creative initiative of workers have all yielded perceptible results. Enterprises which have shifted to the new system of accounting achieved better results than they did last year. The amount of goods produced in a period of nine months grew in these enterprises in comparison with the same period last year by more than 11%, the productivity of labor by 8%, and profit by more than 20%.

According to preliminary calculations the country will receive this year 97,000,000 tons of steel, more than 260,000,000 tons of oil, and about 550,000,000,000 kilowatt-hours of electric power. During the year which is coming to a close agricultural workers harvested the best grain harvest in the entire history of Soviet power. Our scientists have achieved great successes in the fields of physics, chemistry, radioelectronics, biology, and medicine and in creating superhard materials, unique vehicles and machine tools, supersonic airplanes, and powerful missiles.

The December Plenum of the Central Committee of the CPSU pointed out that, in combatting the aggressive forces of imperialism and in following step-by-step the Leninist course of peaceful coexistence of governments with different social structures, the Central Committee of the CPSU and the Soviet government achieved further strengthening in our country's international position. At the same time the aggressive policies of imperialist powers, primarily the policies of American imperialism and those of aggressive circles in the Federal Republic of Germany, have raised serious obstacles in the path of normalizing the international situation and strengthening the peace. Under these conditions the Soviet Union and other socialist governments consider it their duty to strengthen the defensive organization of the Warsaw Pact and improve the level of combat training in their armies and cooperation among them. Possessing modern weapons, these armies are always in readiness to defend the gains of the world socialist system and give a decisive repulse to any aggressor.

In meeting the demands of the 23rd Congress of the CPSU concerning all-round strengthening of the defensive might of our Motherland, personnel in all services of the Soviet Armed Forces during the last training year raised the level of combat and mobilization readiness. The new equipment which was sent to units was successfully mastered. Troop training took place under difficult conditions which approached actual combat as closely as possible. At tactical exercises, during flights, and on long ocean cruises the practical skill of crews, combat posts, and crews was strengthened. Highly mobile and swift actions involving units of podrazdeleniye and chast' size and ships which are applicable to the conditions of nuclear missile and also conventional warfare were practiced.

Tactical exercises, including the joint exercise "Vltava," in which units of the Hungarian People's Army, the National People's Army of the German Democratic Republic, the Soviet Army, and the Czechoslovak People's Army took part, show graphically the increased level of skill of troops in handling all types of weapons, the operational-tactical maturity of command cadres, and the readiness of troop units to conduct combat action under the complex conditions of modern war.

The Armed Forces are entering the new training year with a pledge to expand socialist competition in order to greet the glorious anniversary of Soviet power in a worthy manner. Taking up the initiative demonstrated by personnel in the aviation regiment commanded by Colonel A. Vasilevskiy, the armed defenders of our Motherland are confidently storming ever newer heights in combat proficiency, skill and knowledge. As during past years the combat training of podrazdeleniye, chast', and ships has been precisely planned. As a result of a thorough analysis of the experience acquired and a critical evaluation of the shortcomings which were observed, key problems the solutions to which must now receive primary attention were identified.

The danger of outbreak of a new world war and the threat of imperialist aggression are hardly abstract. The 23rd Congress of the CPSU drew attention to the resurgence of this danger and the course of events in the world today confirm it. This requires readiness for immediate action. The concept of constant combat readiness presupposes not only readiness but also ability at any moment to repulse an enemy nuclear attack as effectively as possible. This is why during the new training year it will be necessary to bring to perfection execution of the procedures used to defend against atomic attacks, to repair the damage caused, and to find the best ways for crews and teams of any composition to use their weapons and equipment. All procedures must be worked out during the conduct of mobile actions during the day as well as at night and during the course of swift marches over great distances.

In the new training year ideological work remains a most important component part of all the multi-faceted activity of commanders, engineers, political workers, and Party and Komsomol organizations. Continued and deeper study of Marxist-Leninist theory and the decisions of the 23rd Congress of the CPSU and publicizing the glorious half-century path traveled by the Soviet people and their Armed Forces will contribute to the formation in personnel of high ideological conviction and to instilling devotion to the Party's cause, love for the socialist Motherland, and readiness to defend her.

Moral-psychological training of personnel acquires particular importance under present-day conditions. In explaining the essence and nature of a nuclear missile war and instilling in our people unshakable faith in the victory over aggressors, it is necessary in all seriousness to speak of those difficulties which will be encountered in such a war. Vast devastation, huge losses in personnel and combat equipment, and the need, at times hours on end, to wage intense battle wearing protective clothing will inevitably lead not only to physical but mental strain in soldiers. Every soldier and sailor, sergeant, master sergeant, midman, and every officer, general, and admiral must prepare for this.

The 23rd Congress of the CPSU stressed the need to further strengthen discipline and the state of organization in all sectors of Communist construction. Without a high level of discipline and implicit compliance with the demands of regulations and orders, there can be no constant combat readiness. A most important task of commanders at all levels and political workers, engineers, and technicians is to inculcate conscious discipline and to avoid over-simplification in combat training and laxity in standing watch and maintaining equipment and weapons. Experience has demonstrated that where the state of organization and discipline is on a level in keeping with the highest demands, there will be no accidents or flight incidents,

there the sounding of an alert will catch no one unprepared, and there will be genuinely high combat readiness.

A high level of technical training remains a most important element in combat readiness. In the new training year the level of technical knowledge of personnel to all branches of the service and in all services of the Armed Forces must be greatly improved. Each specialist must master to perfection the equipment entrusted to him and practice the many procedures involved in preparing equipment and operating it in combat to a point where it becomes automatic. Only by so doing will a soldier be able to carry out his duties precisely and without error when he undergoes moral and mental strain. Particular attention must be devoted to carrying out the procedures involved in locating failures and malfunctions and to eliminating them in the quickest possible way.

The growth of the Armed Forces poses increased demands in all fields of activity of command and engineer cadres in the Army and Navy. In modern combat a commander must make an estimate of the situation in an operational manner, at times in a few brief seconds, and then adopt the only correct solution. And for this purpose he must be a genuine expert in tactics and operational art and a capable organizer of troop actions. At the same time each commander is obliged to have adequate engineer and technical training. The extent of his knowledge must encompass all specialties in the podrazdeleniye subordinated to him and his depth of knowledge must be in keeping with the duties he performs. The demands made on a troop engineer are no less great. A military engineer-operator is not permitted to become a narrow specialist. He is obliged to have appropriate operational-tactical training and also certain skills in performing indoctrinational work.

During the course of commander's training in the new year the members of the officer corps must strengthen their skill in leading troops and handling equipment in combat. Using all forms and methods of training and organizing individual training capably, each commander and engineer must master to perfection the knowledge and skills which he needs.

The complex, crew-served weapons in the Army and Navy have led to a large number of different specialties in every crew and team and at every combat post. This distinguishing feature of modern armament has posed heightened demands for skill in methods of instruction on the part of those who organize the training of personnel. As a rule, in preparing subordinates for collective action, an officer must combine individual work with trainees with group, collective training. But the most important thing is to be able to use capably every minute of classroom instruction, exercise, or practical work in performing maintenance on equipment or repairing it for the purpose of furthering the knowledge of personnel and developing their practical skill.

It must not be forgotten that without a high-quality training plant which meets the demands of the present day, it is impossible to achieve the needed effect. In most podrazdeleniye and chast' and on almost all ships the required training equipment is on hand. But this does not mean that there is no need to improve it further. For indeed, equipment and armament continually grow more complex and the demands made on the level of training of specialists continually rise. Unremitting concern for creating and continuously modernizing the equipment on training fields and in training classrooms, persistent introduction of technical means for training, and, where it is considered advisable, programmed instruction, is the duty of all members of the officer corps.

Ability to use the basic methods of instruction in organizing technical training is in a way an art. It is born directly in troop units.

In podrazdeleniye and chast' and on ships the ranks of outstanding experts in methods of instruction -- those who are masters of their trade -- are growing. The situation must be brought about wherein the experience of the best of them is systematically published and becomes the gain of the entire officer corps in our Armed Forces. As life has demonstrated, the articles written on the pages of the Army and Navy press by those who take part in the foremost experiences -- the best officer experts on methods of instruction -- are of huge importance. In speaking of the importance of publicizing the experience of the best experts on methods of instruction, it must be pointed out that until recently there have been almost no large works concerning the basis of instruction in technical training and almost no popular literature on this subject. The Military Publishing House must fill this gap as quickly as possible. The task is a difficult one but the existence in the Army and Navy of leading experts on methods of instruction and those who are masters in organizing instruction concerning complex combat equipment gives us a guarantee of successful fulfillment. As it is said, they have the maps in their hands.

Success in publicizing leading experience and introducing it depends on the purposeful activity of commanders, staffs, political organs, and Party and Komsomol organizations.

The level of combat readiness depends directly on the state of armament -- the material base of victory in combat. In the Army and Navy a great deal of experience has been accumulated in operating, caring for, and repairing equipment. Teams and crews have achieved important successes in extending the period between repairs and in operating combat vehicles. Advanced technological processes in maintaining armament which contribute to keeping their reliability at the proper level are being introduced more broadly. It is essential that we constantly improve the methods used in operating, caring for, and restoring equipment; overcome completely the instances of irregular performance of technical inspections; and eliminate the slightest shortcoming in caring for armament. There must be unconditional observation of the intervals at which technical inspections are performed and further improvement in the methods used to carry them out. All of this will contribute to raising further the level of combat readiness of chast' and ships.

Our Armed Forces are entering the new training year with complete understanding of the missions before them. Soviet soldiers are responding to the call of the December Plenum of the Central Committee of the CPSU to continue to add to the economic and military might of the country, successfully put into action the grand plans for Communist construction, and greet the glorious 50th Anniversary of the Great October Socialist Revolution in a worthy manner by complete fulfillment of the obligations assumed during socialist competition in honor of this glorious date.

25 Years Following the Battle of MoscowTAKING THE "TYPHOON"

* * *

Twenty-five years have passed since that unforgettable time when the Soviet Army inflicted severe defeat on the German Fascist invaders and shattered once and for all the myth about their "invincibility". The plan of the German General Staff which was based on a "blitzkrieg" campaign against our country met complete failure.

The victory won by the Soviet Army in the Battle of Moscow marked a sharp turn in the course of World War II and had tremendous international significance. The entire world became convinced that the Soviet Union was the single force capable of breaking the back of the Fascist beast and freeing the enslaved peoples of Europe from Hitler's yoke.

A very great service in defeating the enemy at Moscow was performed by the Communist Party. The strategic and operational decisions of headquarters were carried out successfully because the Party rallied and cemented the ranks of soldiers, inspired them to accomplish great deeds, and strengthened their faith in the mighty strength of the people. The Party mobilized all the material resources of the country for the struggle against the aggressor.

* * *

At the end of September and beginning of October 1941 the German Fascist command launched an offensive operation on the Moscow avenue of approach which had the code name of "Typhoon." The Hitler clique had not the slightest doubt that this operation, which would be a swirling hurricane of terrible destructive force, would surge on the far approaches to Moscow and that the political goal of the war -- taking the Soviet capital -- would be achieved in a short period of time.

The enemy's concept was to use the strikes of three powerful tank forces advancing from the areas of Dukhovshchina, Roslavl', and Shostka to rupture the Soviet defense and surround and destroy the main forces of the Western, Reserve, and Bryansk Fronts in the area around Vyaz'ma and Bryansk without letting them retreat toward Moscow. Then with no pause whatever they would develop the offensive against the capital of the USSR from the west and at the same time encircle it from the north and south. Not long before launching the offensive Hitler declared that the city must be surrounded so that "not a single Russian soldier nor a single inhabitant -- whether man, woman, or child -- will be able to leave it. Any attempt on their part to do so must be suppressed by force."

The Center Group of Armies which was assigned the mission of seizing Moscow included 77 divisions of which 14 were tank divisions and 8 motorized. This was approximately one-third of all the infantry and two-thirds of all the tank and motorized divisions operating on the Soviet-German front.

Soviet troops on the western avenue of approach were far inferior to the enemy. Despite the measures taken by the Party to increase the output of military goods, we suffered from an acute shortage of tanks, aircraft, artillery, automatic weapons, and ammunition. Against our 770 tanks, 364 airplanes, and 9,150 guns and mortars the enemy threw into Operation Typhoon 1,700 tanks, 950 airplanes, and 19,415 guns and mortars. In numbers he enjoyed a superiority of one and one-half times our forces.

It should be borne in mind that the main mass of enemy combat equipment was much better with respect to quality than that in the hands of

Soviet troops. For example, on the Western Front of a total number of 483 tanks there were only 45 heavy (KV) and medium (T-34) tanks. The most common tank at that time was the light T-26 tank which in armament and armor protection was not able to compete with the German T-IV.

Further, the enemy enjoyed a large advantage in troop mobility. His infantry division contained 62 prime movers, 509 trucks, 393 light vehicles, and 687 motorcycles; a motorized division had respectively 141, 1,353, 918, and 1,473. This made it possible for him to maneuver rapidly from rear to front and across the front. At the same time our soyedineniye used horses for the most part to move equipment and the infantry moved, as a rule, on foot.

The Center Group of Armies, which was prepared for a general offensive; was opposed by the troops of the Western (Colonel General I. S. Konev in command), the Reserve (Marshal of the Soviet Union S. M. Budennyi in command), and the Bryansk (Colonel General A. I. Yermenko in command) Fronts.

The enemy began his offensive against the Bryansk Front on 30 September and against the Western and Reserve Fronts on 2 October. A vast struggle ensued. Soviet soldiers met the German attacks courageously. However, the enemy's numerical advantage in men and equipment in the breakthrough sectors made it possible for him to penetrate the positions of our troops on the first day.

The enemy's onward rush continued. On 7 October he reached Vyaz'ma from the north and south with his highly mobile troops and here he surrounded many chast' and soyedineniye of the Nineteenth, Twentieth, Twenty-Fourth, and Thirty-Second Armies. Soviet soldiers continued to fight fiercely in encirclement until 14 October. Having drawn into battle twenty-eight Fascist divisions, they killed thousands of soldiers and officers and put a large amount of combat equipment out of action.

The heroic struggle waged by our troops in the area around Vyaz'ma played an exceptionally important role in disrupting further attack by the enemy against Moscow. Holding such a large enemy force was of great strategic importance. It made it possible for the Soviet command to take many pressing measures to organize the defense on the Mzhaysk Line.

An exceedingly tense situation developed on the Bryansk Front. After rupturing our defenses the enemy pressed his main forces toward Orel and Tula and part of his forces to Karashev. In order to halt his further forward movement General Headquarters of the Supreme Command sent the 1st Guards Rifle Corps with two tank brigades to the area around Ktsensk. The intense fire from ambush laid down by Soviet tankers stopped the enemy on the approaches to this city. Enemy tanks tried to pass to the flanks around our tankers, however, the strike group of the 4th Tank Brigade commanded by Colonel N. Ye. Katukov thwarted this maneuver with a swift counterattack.

The German Fascist headquarters did not expect such stubborn resistance from Soviet troops at Ktsensk. Admission of this indisputable fact can be found in the diary of General F. Gal'der, Chief of the General Staff of the Ground Forces. While on 4 October he remarked that "Operation Typhoon is developing almost classically." On 6 October he was forced to stress the following: "The Second Tank Army of Guderian which has been attacking from Orel to Tula has been subjected to a strong enemy counterattack..."

In order to concentrate the combined efforts of troops protecting Moscow and to control them more firmly, General Headquarters of the Supreme Command adopted the decision to transfer the armies of the Reserve Front to the Western Front and to put General of the Army G. K. Zhukov in command. On 12 October troops of the Moscow Reserve Front were incorporated in the

Western Front. Due to exacerbation of the situation to the northwest of Moscow (the enemy took Kalinin on 14 October) the Kalinin Front, commanded by Colonel General I. S. Konev, was set up by General Headquarters of the Supreme Command on 17 October. The troops in this front were assigned the mission of protecting the capital from the northwest.

During the period 13--18 October combat action did not let up day or night on the Moscow avenue of approach. The enemy, not heeding losses, continued to charge toward Moscow. General Headquarters of the Supreme Command, seeing the seriousness of the situation, sent four new rifle divisions, four tank brigades, and several antitank artillery regiments to the Mozhaysk line of defense. The efforts of the Western Front were concentrated mainly on protecting the following avenues of approach: Volokolamsk (Sixteenth Army commanded by Lieutenant General K. K. Rokossovskiy), Mozhaysk (Fifth Army commanded by Major General of Artillery L. A. Govorov after Major General D. D. Lelyushenko was wounded), Maloyaroslavets (Forty-Third Army commanded by Major General K. D. Golubev), Kaluga (Forty-Ninth Army commanded by Lieutenant General I. G. Zakharin).

While fighting for every inch of Podmoskov'ye, our troops, commanders, and political workers displayed supreme tenacity.

Troops of the 316th Rifle Division which was commanded by Major General I. V. Panfilov distinguished themselves in battles on the Volokolamsk axis. Not a single attempt by the enemy to seize the area around Volokolamsk and open a path to the Soviet capital met with success. Repulsing the continuous attacks made by the Germans over a period of six days, the soldiers in this division knocked out 80 tanks and killed several hundred officers and soldiers.

Personnel in the 32nd Rifle Division commanded by Colonel V. I. Polosukhin bore the brunt of battle on the Mozhaysk axis at the famous Borodino Field. Despite the imbalance in forces, our brave soldiers withstood furious enemy attacks west of Mozhaysk for four days.

On the Maloyaroslavets axis troops of the Moscow People's Contingent, officer candidate battalions of the Podol'sk artillery and rifle-machine gun schools, and two battalions of the reserve regiment and the 17th Tank Brigade reinforced by four artillery regiments and three battalions of rocket launchers fought valorously against the avalanche of enemy tanks.

Although chast' and soyedineniye of the Western Front fought with amazing bravery, they did not succeed in stabilizing the defense on the Mozhaysk Line. The enemy was a few tens of kilometers from Moscow. The capital was converted into a front-line city. In the situation which came about the State Defense Committee adopted a resolution on 19 October in accordance with which a state of siege was declared in Moscow and the areas adjacent to it. The defense of the capital on lines within 100 kilometers to the west was charged to the troops of the Western Front and defense of the city itself to troops of the Moscow Garrison.

This resolution found warm response in the hearts of every Soviet man. Trains carrying combat equipment, munitions, and food moved to Moscow from deep in the rear. At a meeting of Party active members in Moscow which took place on 13 October confidence was expressed that the workers in the capital would rise as one man in the struggle to combat the German Fascist invaders. Thousands of citizens of Moscow who were swept along by a feeling of patriotism and anxiety over the fate of their city moved out to help construct defensive fortifications. The rain and cold which started complicated the problem and made the work immeasurably more difficult. However, people staunchly overcame adversity. Ever newer engineer obstacles and antitank and antipersonnel barriers arose with every passing day on the approaches to Moscow and on the streets of the city itself there appeared barricades, reinforced concrete post obstacles, and

metal "hedgehogs." By the end of October new divisions had been formed from volunteer Communist battalions. At plants and factories the citizens of Moscow, forgetting fatigue, made weapons and repaired the equipment which had been damaged in combat.

Eleven rifle divisions, 16 newly formed tank brigades, more than 40 artillery regiments, and 10 high explosive-flame thrower companies were sent by the General Headquarters of the Supreme Command to reinforce the troops on the Western Front.

The end of October was marked by several counterblows delivered by our troops against the enemy in the areas around Skirmanovo, Dorokhovo, and Haro-Fominsk. The German offensive on the Kalinin-and-Western Fronts faltered.

Troops on the Bryansk Front fought under very difficult conditions at this time. As of 23 October the armies in the front were assigned as follows: Fiftieth Army to the area north of Rtsensk, Third Army to the area of Ponyr', Thirteenth Army to the area around Dmitriyev-L'govskiy. On 29 October the enemy succeeded in reaching Tula. However, all his attempts to seize the city from the march failed. The garrison in the city, with which a regiment of Tula workers fought self-sacrificingly to the death, and later troops of the Fiftieth Army blocked the enemy's offensive toward Moscow on the south.

In this way the combined efforts of troops and workers in the capital and Moskovskaya Oblast supported by all Soviet people gave positive results. By the end of October the enemy offensive was stopped on the line Volzhskoye Reservoir -- Volokolamsk -- Haro-Fominsk -- Tula. A relative lessening in intensity took place around Moscow.

And still the enemy did not abandon his intention of seizing Moscow at any cost. The Party and the people were obliged to exert all their strength to thwart his intent once and for all. The Soviet Supreme Command, making a correct estimate of the situation, decided first of all to strengthen the Western Front where the main strike force of the German Fascist troops was operating. In the first half of November this front was reinforced by 100,000 men, 300 tanks, and 2,000 guns. By this time Soviet aviation was 1.5 times stronger than enemy aviation.

The triumphal meeting of the Moscow Soviet of Workers Deputies together with Party and public organizations in the capital which took place on 6 November in the underground hall of the subway station at "Mayakovskiy Square" and the Appeal of the Central Committee of the VKP(b) published on the 24th Anniversary of Great October resulted in an exceptionally great spiritual and political uplift among the defenders of Moscow and all Soviet people. I. V. Stalin, on instructions from the Central Committee of the Party, gave a report at the meeting. And on the next day, 7 November, the traditional parade of military units took place on Red Square. Soviet soldiers, when passing the mausoleum of the great leader, V. I. Lenin, gave their oath to the Party to convert the approaches to Moscow into a grave for the German Fascist invaders. The parade was a harbinger of our crushing victory.

Despite the fact that the troops on the Western Front were reinforced by personnel and combat equipment, the enemy was still able to attain a superiority over our troops in men of two times, in tanks of 1.5 times, and in guns and mortars of 2.5 times. On the axis of the main blows he had an even greater advantage. Having such great forces the German Fascist command was confident that this time the Soviet capital would be reduced.

During the second half of November especially fierce battles raged on the northern and southern approaches to Moscow. The slogans of the Communist Party "Not a step backward!" and "The defeat of the enemy must begin at Moscow!" passed from one end of the broad front to the other and inspired all Soviet soldiers to demonstrate tenacity and to accomplish great deeds. The enemy broke through only where no defenders of the capital remained alive. Each step forward cost him severe losses. Thus, in the staff report of the Fourth Tank Group one may read: "Losses are very great. One after the other graves appear containing... first a tanker in his black uniform, then an infantryman in his gray blouse, and then an SS soldier in his camouflaged cape." There was still one more admission: "The fortifications on the approaches to the Volokolamsk--Istra Highway are especially strong... the little villages along the highway have been converted into true fortresses."

During the course of the bloody battles which raged, the enemy again managed to move toward Moscow. On the north he reached the Moscow--Volga Canal, Krasnaya Polyana, and Kryukov. The German Fascist command judged this breakthrough to be a huge success of decisive importance. With respect to the breakthrough the German Information Bureau proudly declared: "Our offensive against Moscow has reached the point where it is possible to see the center of the city through good binoculars." Berlin newspapers were ordered to leave room for publishing information about the fall of "the capital of the Bolsheviks" on 2 December.

However, the hopes of the Germans were not destined to be fulfilled. On the night of 30 November the enemy podrazdeleniye which had broken through to the eastern bank of the canal were completely destroyed. The subsequent energetic actions of the First Shock and Twentieth Armies in the area around Yakhroma and Krasnaya Polyana helped the Sixteenth and Thirtieth Armies stop the enemy who was attacking the right wing of the Western Front. He was forced to revert to a defensive in a position which was not favorable to him. His strike force which had been trying to seize Moscow from the north, was itself attacked by our troops on three sides.

The German Fascist Command placed very great hopes on its Second Tank Army which was attacking Moscow from the south. Turning from the fruitless frontal attacks against Tula, it decided to pass around the city, seize crossings over the Oka River, and develop the offensive against the capital from the southeast. Numerical superiority in men and weapons, primarily in tanks, made it possible for the enemy to press the Fiftieth Army, the troops in which had been weakened in the many days of preceding battles. By 25 November enemy tanks reached the southern edge of Kashira. On this very day the Second Cavalry Corps commanded by Major General P. A. Belov and the 112th Tank Division commanded by Colonel A. L. Getman started to move. On 27 November they delivered a counterblow and in a period of several days they threw the enemy back to the area around Mordves and to the south of it.

When he met with failure on the northern and southern approaches to Moscow the enemy tried to break through the defenses in the center of the Western Front. On 1 December he managed to do this in a sector north of Naro-Fominsk and to drive a wedge in the positions of our troops to a depth of 10 to 20 kilometers. But further movement by enemy tanks was stopped by the stubborn defense of Soviet soldiers. On 3 December the Thirty-Third and Fifth Armies launched counterblows as a result of which the enemy suffered great losses and was thrown back to his initial position.

Thus ended the last attack by the German Fascist hordes against Moscow. The Red Army had won a defensive fight. Enemy strike forces

were drained of their life blood and deprived of the capability of continuing active combat action. The successfully executed blows by our troops in the areas around Rostov-on-the-Don and around Tikhvin in November and December had a great effect on the outcome of this struggle.

The defeat at Moscow was like lightning in a clear sky for the Hitlerian clique. What did they blame for the collapse of their loudly proclaimed march against the Soviet capital? It seems they blamed the bad fall roads and the winter cold. A false version! Incidentally, even to this day Nazi leaders who remain alive and all kinds of western falsifiers of World War II history continue to say the same thing.

The enemy offensive was shattered by the supreme tenacity of Soviet soldiers and the unparalleled courage of the Soviet people with their firm faith in the victory of their righteous cause.

...And so, the Red Army gave a decisive repulse to the enemy on the near approaches to Moscow. The first major victories raised the spirits of our troops. The situation became ripe for reverting to a counteroffensive on the main Moscow avenue of approach.

The plan for the counteroffensive called for powerful, simultaneous blows by troops of the Western Front in conjunction with troops on the left wing of the Kalinin Front and the right wing of the Southwestern Front to destroy main enemy forces operating north and south of Moscow and then by a swift offensive to the west to complete destruction of the main forces in the Center Group of Armies.

Two powerful forces were concentrated on the flanks of the Western Front.

The force in the north, which consisted of the Thirtieth, First Shock, Twentieth, and Sixteenth Armies and the right flank soyedineniye of the Fifth Army, was deployed on a front extending from Sverdlovo to Kubinka. It had the mission of destroying the main forces of the Third and Fourth Tank Groups of the enemy by blows aimed at Klin and Solnechnogorsk and then to develop the offensive to the west and southwest.

The southern group, consisting of the Fiftieth and Tenth Armies and troops on the left flank of the Forty-Fifth Army and the First Guards Cavalry Corps reinforced by rifle and tank divisions, having deployed on a front from Serpukhov to Chernav, had the mission of destroying the enemy's Second Tank Army in the area east of Tula and Stalinogorsk and then to develop their offensive toward Kaluga and Sukhinichi.

Troops from the left flank of the Fifth Army, the Thirty-Third and Forty-Third Armies, and the right flank soyedineniye of the Forty-Fifth Army were disposed in the center of the Western Front in a sector stretching from Kubinka to Serpukhov. They had the mission, prior to destroying the main enemy forces, of defending firmly the line they were occupying and then, exploiting the success of the offensive of the forces on the flanks, to attack toward Borovsk and Maloyaroslavets with the goal of destroying the German Fourth Army.

The Kalinin Front was to use the forces of the left flank soyedineniye of the Twenty-Fifth Army and the right flank soyedineniye of the Thirty-First Army to deliver a blow in the general direction of Megotino for the purpose of encircling and destroying enemy forces in the area around Kalinin. At the same time the main forces of the Thirty-First Army were to attack from the area around Vidogoshch' toward Turginovo to the rear of the enemy's Third Tank Group. Troops in the right wing of the Southwestern Front,

who were in the Third and Thirteenth Armies and the Fifth Cavalry Corps, had the mission of destroying enemy forces in the area around Yelets and developing the offensive in the direction of Orel.

On the eve of the counteroffensive the Military Council of the Western Front appealed to the soldiers and commanders to fight bravely and decisively, coordinate closely in combat, and destroy the German Fascist invaders mercilessly. Each soldier's feeling of responsibility for the fate of his socialist Fatherland rose even higher and his confidence in his ability to deliver a crushing blow against the enemy grew stronger.

The Soviet rear areas, having rearranged their work for military production, increased the rate of output of military goods. Tanks, guns, mortars, machine guns, and antitank guns started to flow to the front in increasing quantities. Rocket launcher artillery battalions which were armed with the KI-8 and KI-13 mounts were formed in increasing numbers. New types of airplanes such as the PIe-2 bomber, the IL-2 assault plane, and the Yak-1, LAGG-3, and MIG-3 fighter were supplied in increasing numbers.

The counteroffensive began on 5--6 December. It opened a new stage in the Battle of Moscow. The enemy's defenses were ruptured by powerful blows. Maneuvering skilfully and acting at times off roads in the deep snow and fighting day and night, Soviet soldiers destroyed the close-in reserves of the enemy. The latter retreated, offering furious resistance. A direct consequence of our counteroffensive was Hitler's order on 8 December to revert to the defensive along the entire Soviet-German front.

As a result of the counteroffensive from 5 to 30 December the Soviet troops liberated more than 11,000 populated places from the occupying Germans. The enemy was thrown back 100--250 kilometers from Moscow. The direct threat to the capital of our Motherland passed.

The counteroffensive at Moscow developed into a general offensive which came to an end in April 1942. Nine of our fronts and three fleets took part in it. Moskovskaya, Tul'skaya, and Ryazanskaya Oblasts, many rayons of Leningradskaya, Kalininskaya, Smolenskaya, Orlovskaya, Kurskaya, Khar'kovskaya and Donetskaya Oblasts, and the Kerch' Peninsula were completely cleared of the enemy.

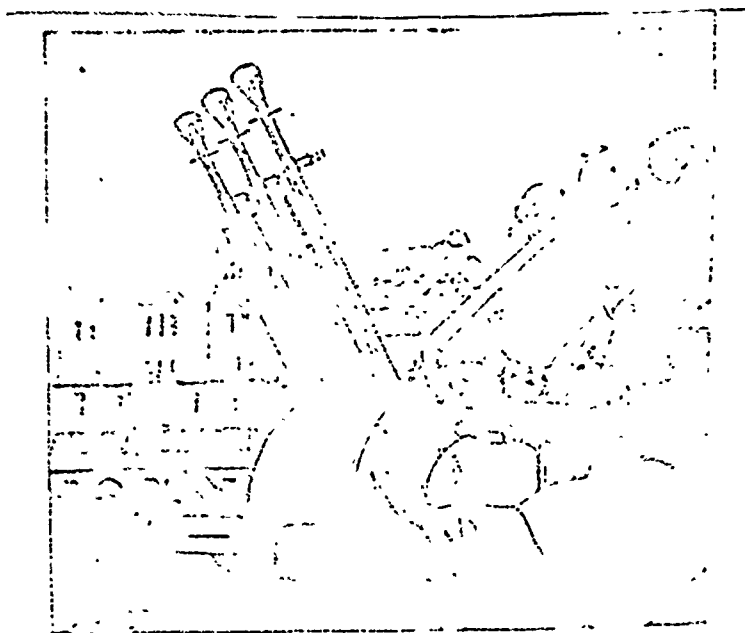
In the course of the winter offensive the Soviet Army destroyed 50 enemy divisions. According to data provided by the chief of the German general staff the German ground forces during this time lost more than 400,000 soldiers and officers. This was the first major defeat suffered by Germany in World War II.

During the course of the winter counteroffensive the mass heroism of the Soviet soldiers was demonstrated with renewed strength. 36,000 soldiers and commanders received orders and medals. For exemplary execution of combat tasks and demonstration in so doing of valor and courage 14 divisions, 3 cavalry corps, 2 rifle and 5 tank brigades, 9 artillery, and 6 aviation regiments and several special chast received the honored title of "Guards."

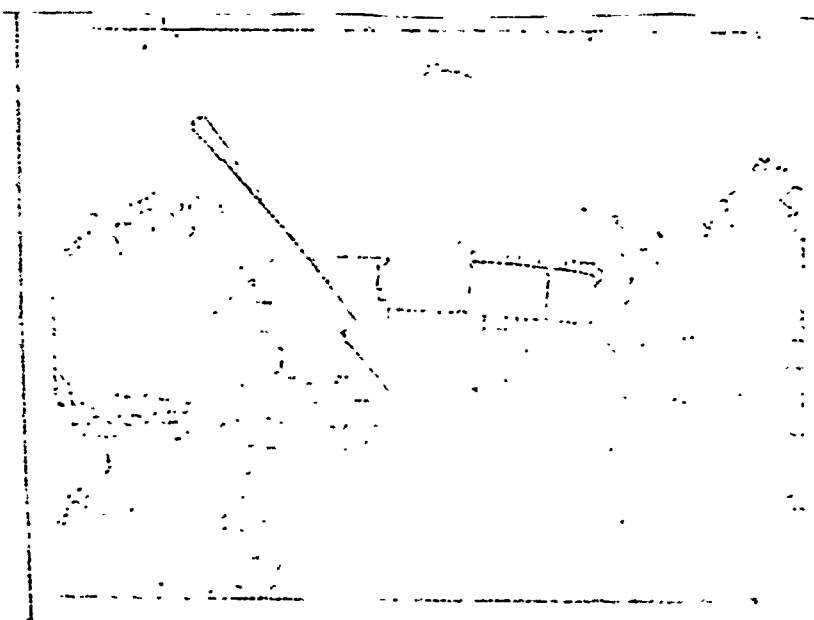
The heroic struggle waged by the Soviet people in the enemy rear contributed to the first victories won by our troops. The people's avengers delivered unexpected blows against enemy headquarters and communication centers, destroyed his motor vehicle transport and supply trains carrying food and military gear, blew up ammunition and fuel depots, and derailed trains.

The great feat of the defenders of Moscow has been written with golden letters in the history of the struggle waged by the Soviet people for freedom and independence. In marking the historic victory of the

Red Army at Moscow the Presidium of the Supreme Soviet of the USSR in a ukase dated 1 May 1944 founded the medal "For the Defense of Moscow" which was awarded to all participants in the heroic defense. On the 20th Anniversary of the victory of the Soviet people in the Great Fatherland War Moscow was awarded the honored title "Hero-City" for outstanding services to the Motherland and the mass heroism, courage, and tenacity of the workers of the capital.

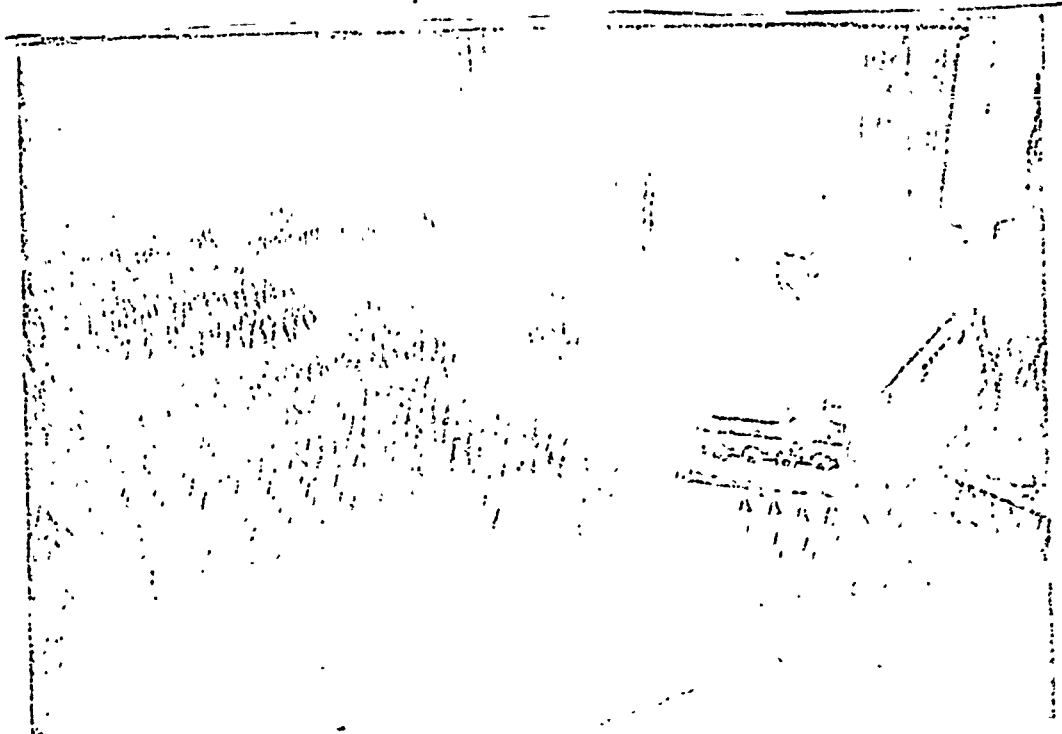


Defenders of Moscow's skies. A large-caliber machine gun mount on Sverdlov Square. September 1941.

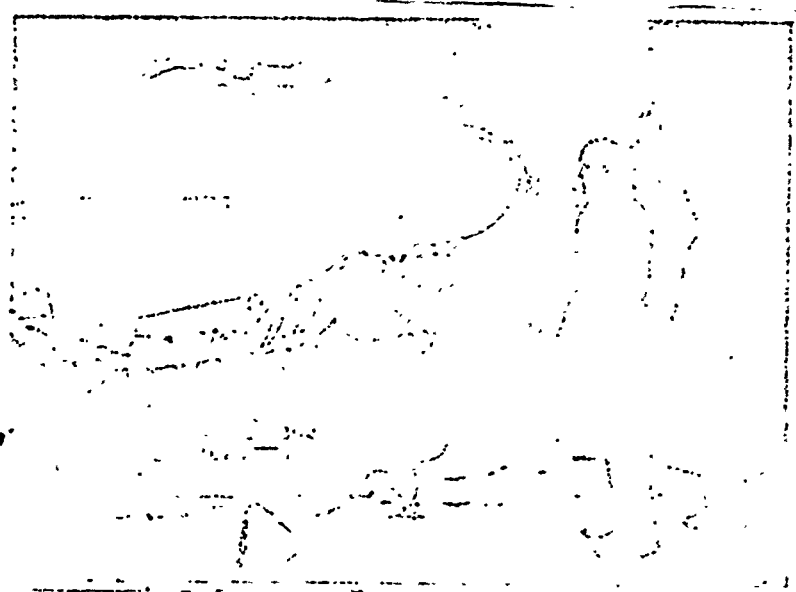


An antiaircraft battery located in the yard of the Planetarium. September 1941.

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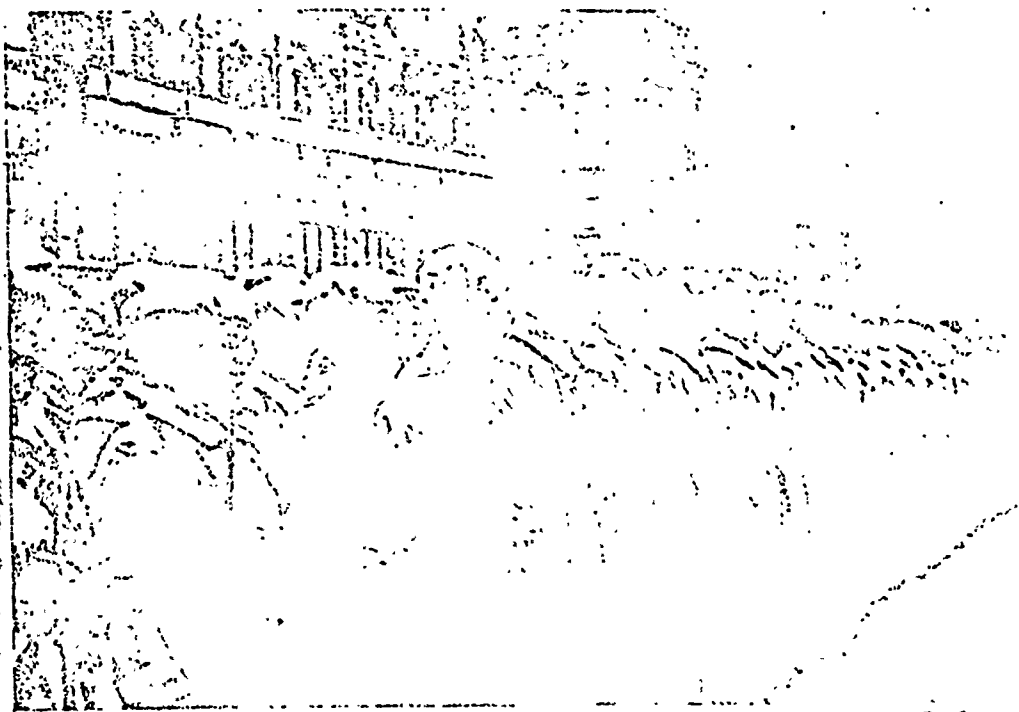
Moscow plants during the battle for the capital supplied the front with weapons and munitions. (Photo by Al. Less.)



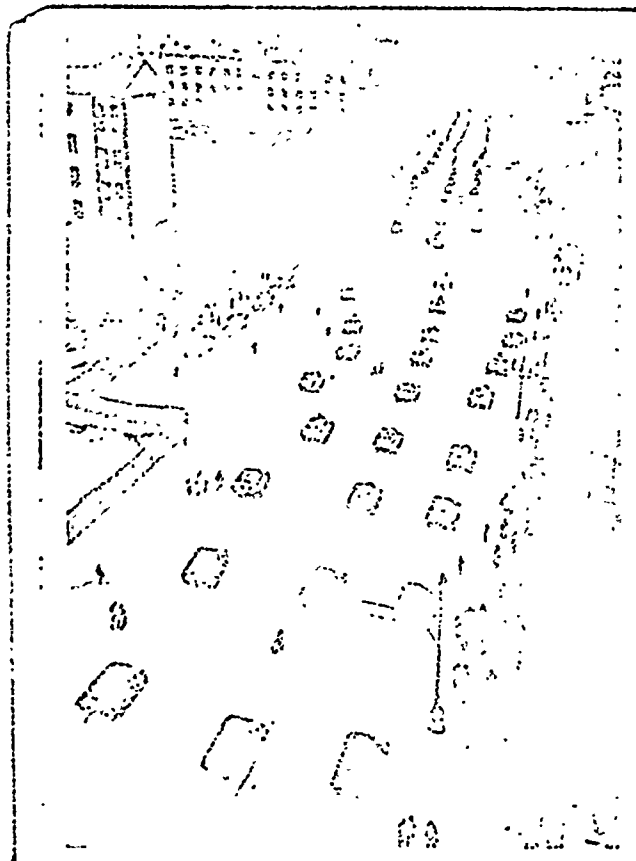
Fierce battles are raging on the approaches to the capital and our aviation continues to deliver powerful blows against the cities of Fascist Germany. Preparations are underway for a night raid. (Photo by S. Fridlyand).

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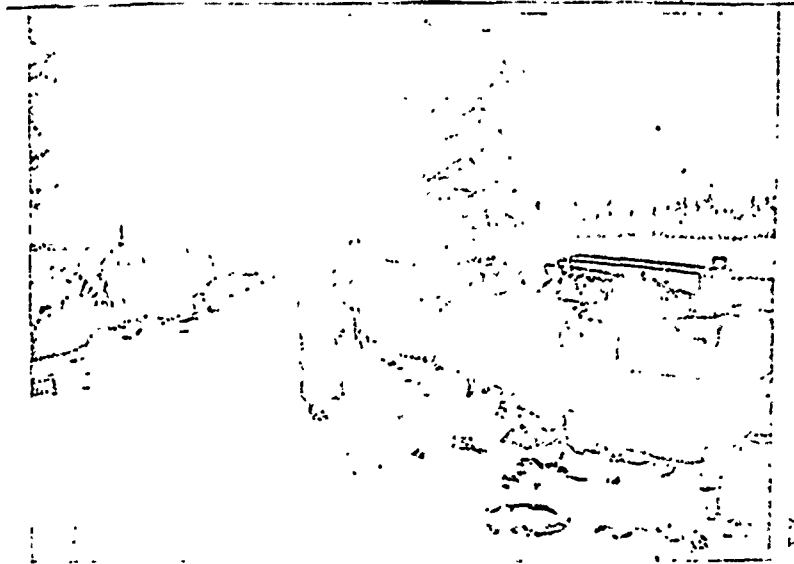
Traditional military parade on 7 November 1941. Chast' of the Second Moscow Rifle Division went straight from Red Square into combat.



Moscow on 7 November 1941. These tanks have just passed in parade formation on Red Square. Soon they will enter the fight to save our capital. (Photo by S. Strunnikov.)

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They went to Moscow. Destroyed German equipment in the area around the city of Klin. (Photo by A. Kapustyanskiy.)

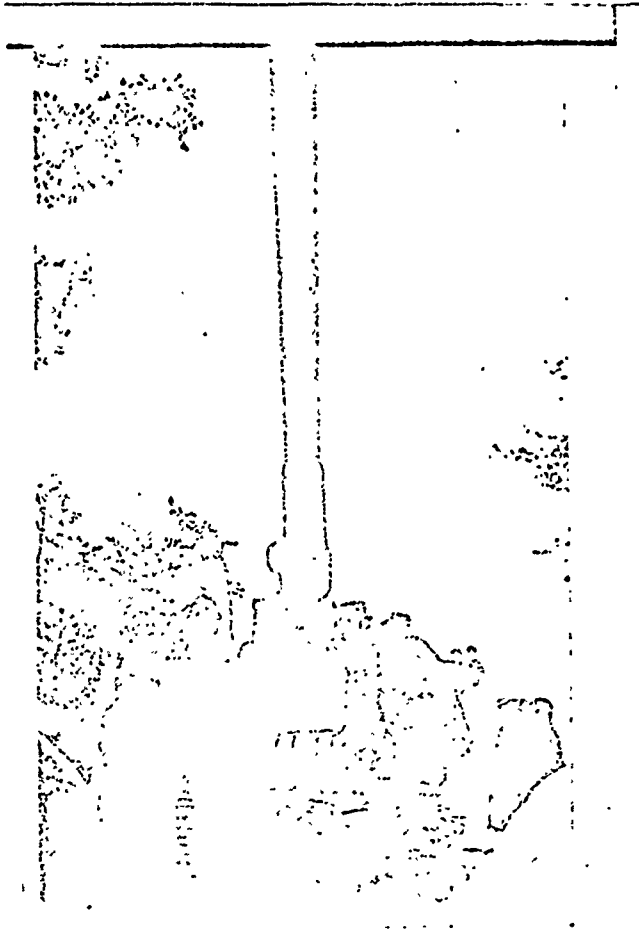


December 1941. Counteroffensive around Moscow. Sappers clear mines for tank passages.

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Heavy artillery in firing position in the area around the
Voykov Plant in Moscow. (Photo by A. Kapustyanskiy.)

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GUARDS SIGNALMEN

By Colonel (Reserve) K. Plestov

The Soviet guards were born in the Battle for Moscow. Every guardsman -- soldier, sergeant, officer, and general -- fought capably and self-sacrificingly. The enemy, having greatly superior forces, was not able to cross the defensive lines occupied by guards divisions.

In signal units the first to be awarded the title of guards was the separate signal regiment of the Sixteenth Army, the soyedineniye of which repulsed the assault of vastly superior enemy forces on the Volokolamsk avenue of approach. The enemy tried to destroy the entire control system in the army. His airplanes, artillery, and specially trained sabotage groups searched for and destroyed communication lines, centers, and other structures. Often the teams which were sent out to repair the damage done to communication lines encountered enemy groups and they had to clear their path with their weapons. Specialists in communication centers did not stop working even when the enemy lowered heavy barrages on control points. They found alternate routes to establish communication with soyedineniye when the main lines were put out of action. As a result commanders did not lose control of their troops even during the most critical moments.

In 1941 the first men in the chast' received orders. The entire regiment and all signalmen in the Army were proud of what they did. In 1942 more than 100 telephone operators, telegraph operators, and radiomen received orders and medals. During the next year about 130 men received high government awards, in 1944 204, and in the year of victory, 1945, headquarters made awards to 270 signalmen.

In the orders and medals was recognition of the heightened skill and courage of all personnel in the regiment, the guards banner of which signalmen carried with honor to the end of the war. The honored title of "Orshanskiy" and the order of Aleksandr Nevskiy constitute the just award to a chast' the soldiers, sergeants, and officers in which fought as is befitting guardsmen.

HEROISM

By Major General V. Shtyrlyayev

* * *

"...Troops of the Western Front," it is stated in an order of the Military Council of the Western Front published in November 1941, "to whose lot has befallen a historical mission -- defending Moscow -- are offering heroic resistance to the enemy's assault..."

"The enemy's strength has been drained but he is still strong and continues to attack..."

"After thwarting the enemy's plans and repulsing his next attack we will not only not prevent him from reaching Moscow but we will preordain victory over Hitler."

"Not a step backward! -- such is the order the Motherland gives us, the defenders of Moscow!"

Each line of the order and each word in it revive in the memories of those who participated in the Battle of Moscow the feats of Soviet people who defended their beloved capital in fierce, bloody battles and who destroyed the Fascist hordes on the fields of Podmoskov'ye.

* * *

Troops of the 316th Rifle Division which later became the Guards Rezhitskaya Orders of Lenin, the Red Banner, and Surorov Division named Hero of the Soviet Union General I. V. Panfilov distinguished themselves especially.

I had occasion to fight with the members of the Panfilov Division at Moscow. I saw their courage and tenacity in defense and decisiveness in attack. No difficulty whatever could stop the men in the Panfilov Division. They attacked the enemy bravely and won.

I recall how on 21 September 1941 a platoon of scouts commanded by Lieutenant Vizer, a Komsomol member, was the first to join combat with the enemy in the village of Pustynka and win victory. He drove the Fascists, out of the village, killed five of them, and seized four sub-machine guns and a hand machine gun. This is the way the combat record of the division began.

It was October. An enemy tank accompanied by infantry entered the village of Fedos'ino. Captain Manayenko quickly organized a group of soldiers and went to intercept the Fascists. An accurately thrown anti-tank grenade landed right on his target. The tank became enveloped in flames and stopped on the spot. A close-in skirmish started and the firing was almost point blank.

The Fascist received reinforcements in the form of several tanks and a company of infantry. In the uneven battle the small handful of soldiers fought off the fierce attack. The commander, despite severe wounds, continued to direct the actions of the group, he himself setting an example of valor. After taking a barn and preparing it for a defense, the troops continued to fight heroically.

The Fascist managed to set fire to the barn and they offered our troops a chance to surrender. The answer came back:

"Russians do not surrender!"

Communist Ivan Mikhaylovich Monayenko, a true son of his Motherland, fought to his last breath. His clothes were burning and the fire scorched his skin. Soldiers requested him to go to cover but he remained and died on the line. He alone destroyed two tanks and killed more than 70 Fascist invaders. The men in the Panfilov Division held the line and checked the enemy. For his feat Ivan Mikhaylovich Monayenko was posthumously awarded the Order of Lenin.

The feat performed by the 28 guards Panfilov men can perhaps be called the epitome of human courage. There is not to be found in history a more unequal battle than the one between 28 guardsmen and 50 tanks. It took place on 16 November on the very first day of the enemy offensive against Moscow at the Dubosekovo Siding.

Enemy armored columns were charging toward Moscow in the hope of breaking the resistance of our troops at any cost.

Thousands of shells and bombs exploded on the forward edge of our positions and in the rear. Then 20 German tanks accompanied by submachine gunners moved toward the trenches occupied by the men in the Panfilov Division.

Political officer Vasilii Klockov, who came to join the defenders of Dubosekovo, said:

"Twenty tanks! That is less than one for each of us. That's not so many."

The battle began. Grenades, Molotov cocktails, and shells rained on the tanks. A cloud of smoke rose over the field of battle. The enemy could not withstand it. He stopped and then turned back. The enemy threw 30 more tanks against the handful of brave men. The battle lasted four hours. For four hours the Fascist tanks and infantry stormed the defensive line. But the unbending will of the men in the Panfilov Division proved to be harder than armor. The enemy did not pass.

The Berlin Stockmarket Newspaper wrote:

"The behavior of the enemy in combat cannot be explained by any rules. The Soviet system which created the Stakhanovets is now creating the Red Army Man who fights fiercely in a hopeless situation.

"...The Russians for some reason offer resistance when there is no point in resistance. For them it seems that the war is being fought not on the ground but in some imaginary world."

No, our soldiers did indeed fight on the ground and on their own sacred ground which was to become covered with blood. In front of them was a cruel and implacable enemy. Soviet soldiers fought guided by the motto: "Victory or death!" Having risen they conquered death and the enemy. And immortality became the monument to them!

For their unbounded courage, heroism, great valor, and daring and for their limitless devotion to the socialist Motherland and to the Communist Party, the Soviet government posthumously awarded participants in the battle at Dubosekovo Siding the title of Hero of the Soviet Union.

Later it was learned that not all of the 28 Panfilov men died. Red Army Man I. K. Natarov died three days later from his severe wounds in the hospital. Privates I. R. Vasil'yev and G. M. Shemyakin were picked up by Dovator's horse cavalry in serious condition and after treatment they returned to their former division. V. F. Fedoseyev, his health undermined in the severe fighting, died in 1949.

On 17 November 1941 the 316th Rifle Division was redesignated a guards division for the feats accomplished by it in the name of victory. On that very same day the Order of the Red Banner was awarded to it by a ukase of the Presidium of the Supreme Soviet.

Major General I. V. Panfilov kept firm control of the regiments in the division and he knew what was being done and where, where things were especially difficult, and where a serious threat was developing. He appeared there in person, assigned missions to his subordinates, and gave precise instructions. As a result he won the battle. He was a capable and talented military leader of exceptional bravery whom the entire division followed.

The soldiers called him father. He was a hero of the Civil War and had survived the severe school of combat for Soviet power in the Chapayev Division. For his services he was awarded two Orders of the Red Banner. He joined the Party in 1920 and his work as a commander was always distinguished by Bolshevik ideals and militancy. Together with S. A. Yegorov, the division commissar, I. I. Serebryakov, the chief of staff, I. V. Kaprov and G. F. Kurganov, regimental commanders, and other officers Panfilov was able to put together a division which was able to carry out the most difficult combat mission. The best features of a Soviet man were revealed in the soldiers, sergeants, and officers in the division and, what was most important, great love for the Motherland and irreconcilable hate for the enemy.

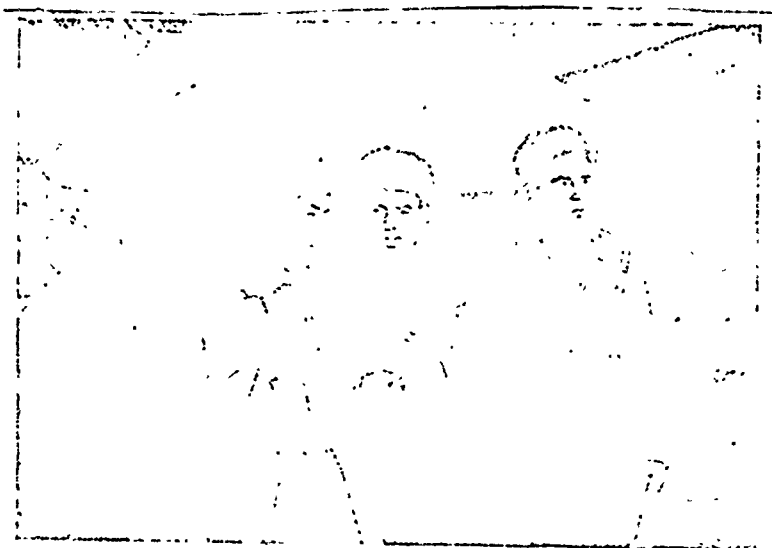
Ivan Mikhaylovich prepared constantly for that moment when the division would revert to the offensive. But he did not succeed in leading his guardsmen into the attack. General Panfilov died the death of the brave on 18 November 1941 in the village of Gusenvo not far from Volokolamsk. Every guardsman in the division mourned the death of his beloved commander and considered this loss a great personal sorrow.

The Presidium of the Supreme Soviet of the USSR awarded Major General Panfilov the title of Hero of the Soviet Union and the State Defense Committee awarded the name of Major General I. V. Panfilov to the division in a decree dated 23 November 1941. In subsequent battles personnel in the Panfilov Division displayed mass heroism. Heroism was displayed especially brilliantly in liberating the Pribaltika and in particular the cities of Rzhitis and Riga.

...A monument to the men of the Panfilov Division stands at Duboskovo Siding. The names of heroes are inscribed on it in gold letters. Live flowers bloom at its base from early spring to late fall. They are brought here by soldiers, sergeants, and officers and also pioneers and Communist members and citizens of all ages.

Young soldiers accept the combat traditions of their fathers and older brothers like a baton. In all chast and soyedineriye there have been set up museums or rooms of combat glory. They are visited by delegations of workers, young people, and Pioneers. In the Museum of Combat Glory of the Panfilov Division a great deal of work is done to advertise combat traditions. It has been visited by Marshals of the Soviet Union A. A. Grechko, S. S. Biryuzov, and I. Kh. Bagramyan and others. In the visitors book Marshal of the Soviet Union S. S. Biryuzov wrote: "The combat history of this famed division is remarkable. It will instill in our soldiers and young citizens a spirit of devotion to our Motherland and to the Communist Party." Here is still another entry: "We sailors from a destroyer visited the Museum of Combat Glory of the famed Panfilov Division. We are proud of the feats accomplished by our fathers and those who gave their lives for the bright future of our people."

The unfailing glory of the heroic defenders of Moscow continues to live in all the patriotic deeds of soldiers and their accomplishments in mastering the newest combat equipment and operating it capably.

GRAPHIC NOT REPRODUCIBLE

Guards Major General I. V. Panfilov (extreme left), commander of the Eighth Guards Rifle Division, Lieutenant Colonel I. I. Serobryakov, the division chief of staff, and S. A. Yegorov, the division military commissar and senior battalion commissar. On the Western Front, 18 November 1941. (Photo by M. Kalashnikov.)

In Honor of the 50th Anniversary of Great OctoberTHE WORD OF TANKERS

By Lieutenant Colonel I. Moskov

In the tank company commanded by Guards Captain Viktor Alekseyevich Trunin they remember very well the gathering of personnel which took place soon after the work of the 23rd Congress of the GTSU had been completed. After weighing all their capabilities the tankers assumed the following high obligation: By the 49th Anniversary of Great October, that is, during the first stage of the competition in honor of the 50th anniversary of Soviet Power, to train 50% men rated excellent, 80% rated sportsmen, and 60% wearers of the badge showing completion of the military sports complex. Each mechanic-driver and gunner assumed the obligation of raising his rating by one degree.

Speaking frankly, these guards soldiers set before themselves a difficult task. The company commander understood very well that to carry out the task all men in the company would have to exert all their strength and energy. He also recognized the fact that without firm knowledge of equipment and weapons and without capable operation of it, it would be impossible to achieve the goal which had been marked out. Therefore, Officer Trunin, immediately following the meeting, directed his efforts toward having every soldier first of all study the physical make-up of the equipment and weapons assigned to him and acquire firm technical knowledge. He made sure that every exercise was conducted on a high methodological level and was well supported with training aids and that not a single training minute was wasted.

Officer Trunin himself is an excellent expert on equipment. He completed a technical school and for several years served as a deputy company commander for material. Viktor Alekseyevich was present during many periods of instruction at which tanks, guns, and machine guns were studied and driver training, and tank firing exercises taken up. He pointed out the shortcomings in the methods used and helped to correct them on the spot. Lieutenant V. Rozhkov, for example, was inclined to give too much explanation during instruction, omitting practical work. The captain advised him to keep closer contact with his listeners, discuss things with them, and at the same time explain complex points.

"Pay more attention to practical work," said Viktor Alekseyevich to the lieutenant. "Teach the mechanics-drivers to perform repair under field conditions and meet the prescribed standards in performing maintenance on equipment."

The tankers constantly seek and find new ways and methods to increase their technical knowledge. At the initiative of Communists who are supported completely by the commander, in the company technical and firing circles have been set up. What the guards soldiers did not manage to learn thoroughly at planned instruction they studied in these circles. In this way the "white spots" in the technical knowledge of soldiers gradually disappeared.

All personnel in the company take an active part in technical conferences and displays. At conferences the soldiers listen attentively to the talks given by outstanding crew commanders, mechanics-drivers, and gunners who share their own experience and everything that is new and valuable. The fact that the crew in the company consisting of Senior Sergeant Yuriy Yaroslavtsev and Privates Nikolay Sorokin and Anatolli Chirikov took first place in battalion competition in meeting prescribed standards is evidence of the high level of technical training among the soldiers.

Having become convinced of the firm technical knowledge had by their subordinates, Officer Trunin and the platoon commanders waged a concerted effort to master the practical skills needed in driving a tank and firing a gun. At instruction in tank driving the soldiers several times, at first step-by-step and then taking the action as a whole, practiced the technique used in crossing every obstacle until precise and confident action was achieved. While at first Mechanics-Drivers Zubarev, Pirozhnikov, and Abramov had difficulty passing through a passage in a mine field at low speed, now they are able to do this in third or even fourth gear.

A restricted passage with two turns was causing the tankers much grief. At first Junior Sergeants Nikolay Rehtin and Mikhail Shlykov and others were unable to cross it and they brushed up against the barriers. Their mistake was that they selected the moment for turning their tank incorrectly. This must be done only after two-thirds of the tank has emerged from the passage. But they hurried and therefore they knocked down the barriers. Assiduous training helped these guardsmen eliminate this shortcoming.

Training in firing a tank gun was done painstakingly. In this the step-by-step method was observed strictly and the soldiers passed from the simple to the complex. They trained in setting a sight exactly and aiming the gun at a target using a special bench. It sometimes happened that gunners Privates Yuriy Mal'tsev and Viktor Chulkov forgot to change the settings when shifting fire from one range target to another. And, of course, when they fired they did not complete the exercises. Additional instruction had to be conducted with them. It must be stated that the commander used a differentiated approach to training the tankers. At lessons more attention was devoted to those soldiers who lagged behind and had learned the subject material poorly.

Particular use was made of training aids at tank-rifle training periods. Prior to taking up firing from a tank they trained for a long time in delivering fire at targets using small caliber rifles. The guardsmen attached the rifle to a special mount beside the sight, set up range targets on a miniature range, and carefully practiced one exercise after the other.

The instructors in charge assigned missions and the gunners fired them. Then the training was shifted to the turret of a rocking tank and only after this to an actual combat tank. The soldiers trained no less patiently in determining ranges to targets. At first they did this by eye, then with the help of binoculars, and then, at the end of the exercises, using a tank sight.

This method of training gave positive results. The guardsmen acquired firm skill in firing from positions -- in place, at short stops, and on the move. After a while they began to hit their targets, as a rule, with the first round or with the first burst.

Officer Trunin managed to develop in his subordinates a deep feeling of responsibility for their success and the success of a comrade or the entire collective. The principle of the moral code: "One for all and all for one" became an immutable law in the life and training of these guardsmen. If any one of the soldiers began to drop behind on the way toward acquiring a high level of combat skill, he received immediate help from his comrades. At one time gunners Privates Aleksandr Kobolev, Vladimir Moskvichev, and German Smirnov were having trouble in training. Sergeants Aleksandr Andreyev and Dmitriy Borodin, First-class specialists, came to their help. Mechanics-drivers Junior Sergeant Aleksandr Polkunov and Private Aleksandr Bashko, who understood theory poorly, were extended a helping hand by Sergeants Aleksandr Sigarev and Anatoliy Pirozhnikov. In a short time those who lagged behind had caught up to those with whom they served.

The level of skill of personnel in the company rose day by day. When it came time to add up the results of the competition and give an account

of the work which had been done, they passed all tests with honor. The guardsmen demonstrated their high level of combat training at a verifying test. They hit all targets without a miss, drove their tanks across difficult obstacles at high speeds, and maneuvered artfully on the field of "battle" under conditions when weapons of mass destruction were used.

The tankers in the company commanded by Guards Captain Trunin won a great victory. They report to their Motherland that they are ready to carry out any order. And the word of these tankers is a firm one.

THE BATTALION BECAME AN EXCELLENT ONE

By Lieutenant Colonel G. Bodelan

The signalmen commanded by Officer G. Gevorkyan, after enlisting in the pre-October competition, assumed the following socialist obligation: To train by the end of the training year several excellent podrazdeleniye, to increase the ratings of all specialists, to have all vehicle drivers able to prepare a radio for operation and work with a microphone, to have all radiomen earn a category in radio sport, to train 75% rated sportsmen, and to have only excellent and good results in all training subjects.

A check showed that these guards signalmen have kept their word. All personnel achieved excellent and good results in training, service, and discipline.

The podrazdeleniye commanded by Officers II. Tolstoy, Ye. Pelenkov, N. Derevyanko, V. Posazhnikov, and V. Istranin and also more than 20 squads and crews were rated excellent.

All soldiers are rated sportsmen and rated specialists and the overwhelming majority of them specialist first and second classes.

The radio telegraph operators won a category in radio sport and every vehicle driver has been trained to operate a radio microphone.

Soldiers, sergeants, and officers have achieved a high level of drill and firing training. At exercises they showed a good level of field training and capably maintained reliable communication under difficult conditions. The crews in the radio relay stations headed by Senior Sergeant V. Kobets and Junior Sergeant V. Shadrin are fulfilling all training tasks with high ratings.

Personnel have acquired thorough knowledge of equipment and firm practical skill in operating it under field conditions.

Such successes are the result of the joint labor of commanders and Party and Komsomol organizations.

EXERCISE "VLTAVA"

By Engineer-Major Ye. Pateyuk, Correspondent
of Tekhnika i Vooruzheniye

(Photos taken by author)

In September an exercise which was given a code name of "Vltava" was conducted in Czechoslovakia. Troops of the Hungarian People's Army, the National People's Army of the German Democratic Republic, the Soviet Army, and the Czechoslovak People's Army took part in the exercise. The Minister of Defense of the Czechoslovak SSR, Army General B. Lomskiy, was in command of the exercise. The commander of the combined armed forces of the Warsaw Pact countries, Marshal of the Soviet Union A. A. Grechko, was present at the exercise as was a Czechoslovak Party-government delegation headed by First Secretary of the Communist Party of Czechoslovakia and President of the Czechoslovak SSR, Antonin Novotny. Military delegations from countries which participate in the Warsaw Pact were present.

The joint exercises were the concluding stage of combat training in the current year in the participating friendly armies. There was so much combat and special equipment used in the exercise that if it were lined up in a single column it would stretch almost 850 km.

Heavy equipment, primarily that on tracks, was transported by railroad. It arrived at the concentration area exactly at the designated time and this was much to the credit of Czechoslovak railroadmen. Some chast' and podrazdeleniye moved under their own power. It must be stated that the Soviet troops had to follow a very difficult route. The roads were not very wide, turn-offs were limited, and in populated places which were encountered along the way vehicles had to proceed in single file.

In this situation the traffic control service, which was provided by troops in the Czechoslovak People's Army, was of great importance. They handled their mission very successfully. The traffic control group moved, as a rule, on vehicles which had high roadability and which carried radios. Single YaVA-35R motorcycles were used for operational communication. A traffic regulator had two batons -- one red and one yellow -- and both were electrically illuminated. He wore signal lights on his back and chest. A helmet, which could be seen from afar (luminous paint was used,) completed his special equipment. Timely information from the traffic control service concerning routes of march contributed to rather high rates of movement during the march.

The long march required thorough preparation of vehicles and capable organization of maintenance. It was necessary to foresee all details so that in case of need it would be possible to correct malfunctions rapidly. Some of the participants in our exercise recalled the month of May during the last year of the war when Soviet tankers rushed to the help of Prague which had risen in revolt.

"There was no time to perform repair," related Major of Technical Service V. Gradusenko (at that time he was deputy commander of a tank company). "We mastered the unit method of repair during combat. Now it is especially clear how important it is to plan maintenance thoroughly."

One of the most impressive episodes during the exercise was the parachute assault. Favorable conditions for the parachute assault were created by nuclear strikes delivered at the most important "enemy" defensive areas and by air activity. Under cover of fighter aircraft transport planes dropped the first podrazdeleniye. The huge cargo parachutes which were used to drop self-propelled mounts, guns, and ammunition billowed in the sky. After landing the parachutists, without delay,

entered combat and attacked the "enemy" swiftly.

A helicopter landing force, the actions of which depend less on weather conditions, operated just as successfully. As the exercise showed, a helicopter assault force can operate successfully over very difficult and broken terrain. MI-6 helicopters transported armored carriers, vehicles, and other heavy combat equipment.

In accordance with the plan of the exercise an airfield was seized and later a powerful landing force with heavy equipment was landed there. The Soviet pilots who were flying the AN-12 set up an "air bridge." One after the other, observing the minimum interval, the planes landed. A few seconds later self-propelled artillery mounts and armored carriers were moving around the airfield.

The battery of self-propelled artillery mounts commanded by Captain V. Polyakov operated in an excellent manner. In the battery 65% of all personnel are first and second class specialists. Much of the credit for this goes to the deputy commander for material, Technician-Senior Lieutenant Yu. Primenko. He not only knows to perfection and drives a combat vehicle excellently but he is an expert in delivering accurate fire.

The skill of these parachute artillerymen awakened universal admiration during the exercise. They loaded and unloaded their equipment dexterously. The aircraft crews helped them in doing this. And this is understandable since in a modern combat situation assigned missions must be accomplished successfully in seconds. The artillerymen prepared mock-ups in their podrazdeleniye which reproduced exactly the cargo compartment of an assault airplane. They usually used them to practice procedures used in loading and unloading equipment.

Rivers constitute a serious obstacle for ground troops. Despite the fact that many modern combat vehicles are able to cross water obstacles independently, the need for ferries and bridge crossings still exist. The distinguishing features of modern combat demand ability to set up bridges quickly under greatly varying conditions.

A helicopter landing force had seized a bridgehead on a bank occupied by the "enemy." The sector of the bank suitable for unloading pontoon vehicles proved to be too small to support work on a wide front. Therefore, bridge ferries were assembled on the bank as usual and also above the axis of the crossing. Ferry elements were delivered by helicopter. The assembled ferries, driven by outboard motors, moved under their own power downstream and were moved into the line of the bridge.

Podrazdeleniye of the Hungarian Army and the Czechoslovak People's Armies coordinated successfully. As soon as the lead detachments had seized the opposite bank by crossing on amphibious tanks and armored carriers, assembling the ferries and laying the bridge crossing began. Pontoon podrazdeleniye of the Hungarian People's Army commanded by Captains V. Imre and T. Shandors functioned excellently. Despite the fact that the approach to the river was a difficult one and a narrow bank limited the maneuver of vehicles, the soldiers did the necessary work to assemble the ferries at a very high tempo.

A podrazdeleniye of the Czechoslovak People's Army commanded by Senior Lieutenant P. Fistung crossed heavy equipment successfully where the Vltava River is 800 meters wide. Only a few minutes were necessary after joining the ferries to bring vehicles up for loading. These Czechoslovak experts mastered their new vehicles not long ago. Our soldiers helped them master the complex equipment. Senior Lieutenant P. Fistung remembers his Soviet friends with thanks. The officer transmitted the information which he received to his subordinates. Together with

Major E. Bagen, a specialist first class and an experienced expert in methods of instruction, in order to accelerate the training of mechanics-drivers, he selected the best pontoon operators who had licenses to operate vehicles (in the Czechoslovak People's Army only soldiers who know how to drive motor vehicles are allowed to drive tracked vehicles). After the new vehicles had been studied thoroughly, they started driver training at first on dry land and then in the water. After learning how to drive their vehicles confidently, the drivers began training in joining and deploying ferries and maneuvering in the water. In the podrazdeleniye commanded by Senior Lieutenant Fistung complete interchangeability among all members of crews has been achieved. The prescribed standards here are exceeded systematically and it is no wonder that personnel in the podrazdeleniye demonstrated a high level of skill during exercise "Vltava."

Covering aviation supported ground troops and landing forces. Indeed, success on the ground is possible only after supremacy in the air has been established. Podrazdeleniya of Soviet and Czechoslovak pilots demonstrated the capabilities of modern aviation plainly. Flying at low altitudes, the airplanes delivered strikes at ground targets, suppressing the resistance of antiaircraft defense weapons. The method of dropping bombs in which the airplane flies upward at an angle between 45° and 90° was used. Meeting engagements occurred between fighter interceptors. The fighter bombers commanded by Major A. Volokshin who hit ground targets on the first pass received an excellent rating. The group commanded by Captain M. Anan'yev, Party organization secretary in a chast', distinguished itself in air combat. No less remarkable skill was demonstrated by Czechoslovak pilots first class Major F. Riman, Captain Z. Tuma, Senior Lieutenant Ye. Diblik, and others.

Behind every successful flight by a pilot there stands the self-sacrificing labor of engineers and technicians who maintain these combat planes and get them ready for flight. Major Ya. Drabek, engineer in an aviation regiment of the Czechoslovak People's Army, talks with pride about his subordinates. For example, Captain Ya. Vistreich is an excellent technician. Under his leadership a creative collective demonstrated initiative. When new aircraft arrived it was the group commanded by Vistreich which was assigned the mission of mastering it in a very short period of time. The situation was made even more complicated because it was necessary to perform technical inspections on some airplanes and these airmen did not have adequate experience. Captain Ya. Kuchvalek, secretary of a Party organization, mobilized the Communists. The task assigned by headquarters was carried out on time.

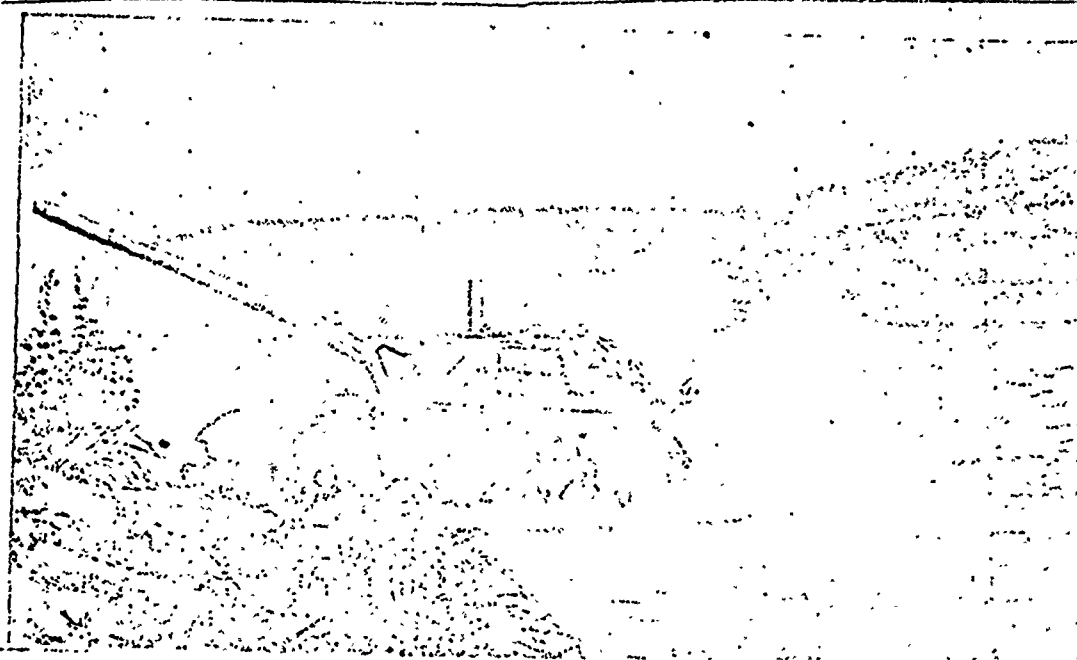
On the concluding day of the exercise the National People's Army of the German Democratic Republic and the Hungarian People's Army demonstrated a meeting engagement between large tank and motorized rifle forces. This battle was preceded by an intense artillery and air duel. But the artillerymen of Colonel K.-H. Khoss, a recent graduate of the Leningrad Artillery Command Academy, delivered fire from well-prepared positions. The crews demonstrated a high level of team work and the firing missions were carried out faultlessly.

Personnel in the motorized rifle podrazdeleniye commanded by Captain Kh. Tamm displayed great initiative. As early as May they drew up a detailed schedule for training in preparation for the exercise involving their brother armies in which they marked out specific tasks for each day. The amount of work done was huge and the results speak for themselves -- 98 soldiers received the title of "Excellent Marksmen." The number of rated specialists grew greatly. The podrazdeleniye occupied first place in all aspects of combat training and demonstrated splendid field training during the exercise.

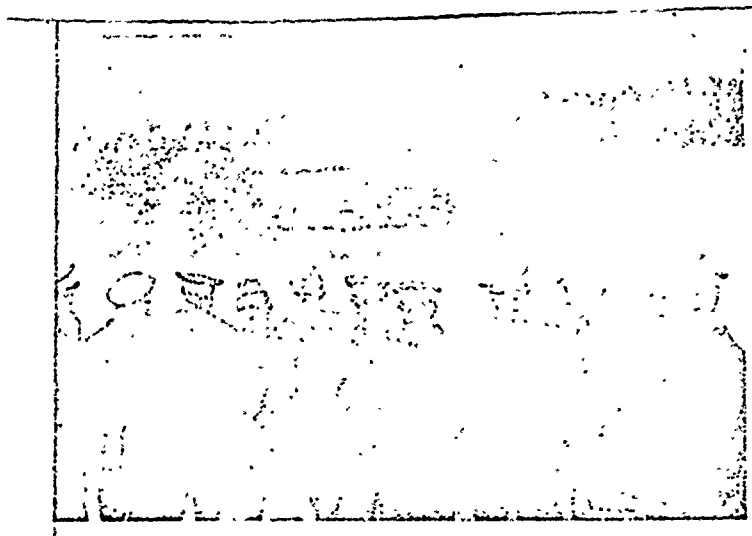
The "enemy" proved to be no less well trained. The swift tank and motorized infantry counterattacks launched by the Hungarian People's

Army forced the attackers to revert to the defense. After recall the umpires gave a high rating to the actions of both sides.

Exercise "Vltava" once more confirms the monolithic nature of the combat union of the countries in the socialist camp and shows with complete clarity that the armies which are standing guard over the peaceful creative labor of their people have mastered the art of modern combat actions to perfection.



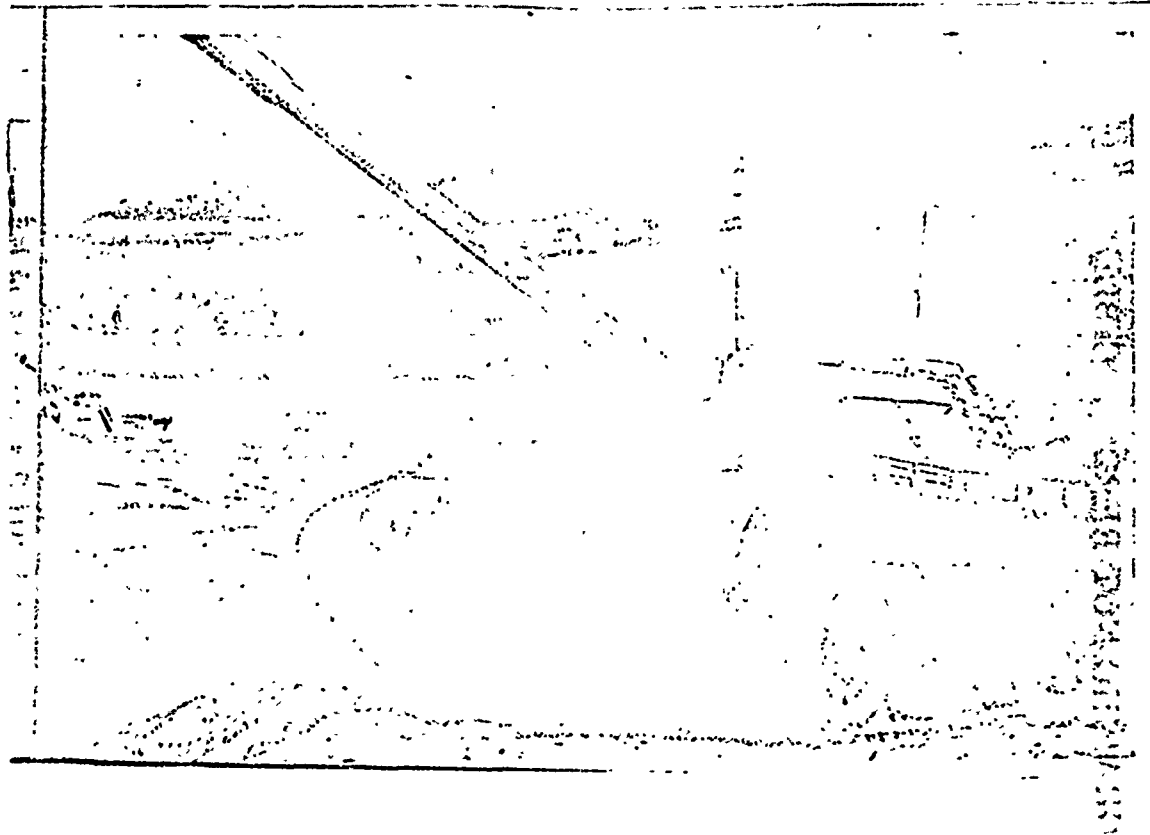
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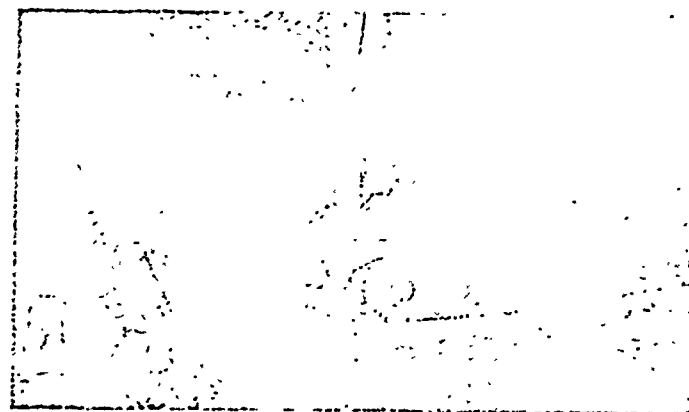
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In the breaks between "battles" there were friendly meetings, a lively exchange of impressions, handshakes, smiles, and keepsakes.

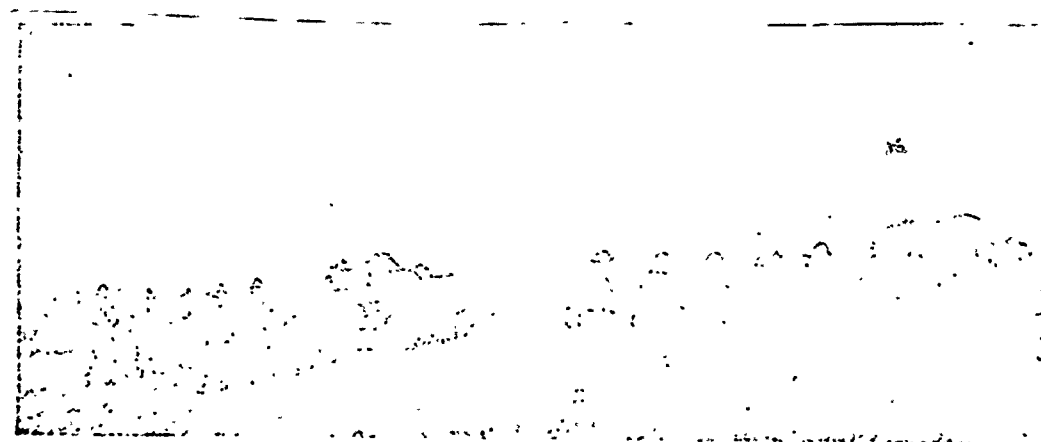


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Soviet motorized rifle troops on the march.

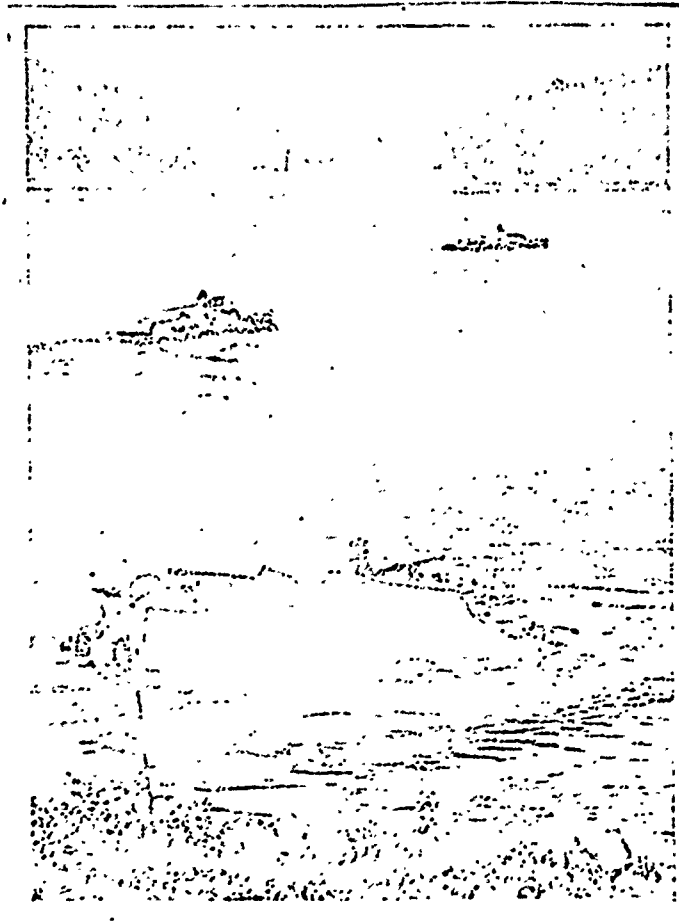


Soldiers in the National People's Army of the German Democratic Republic attack.

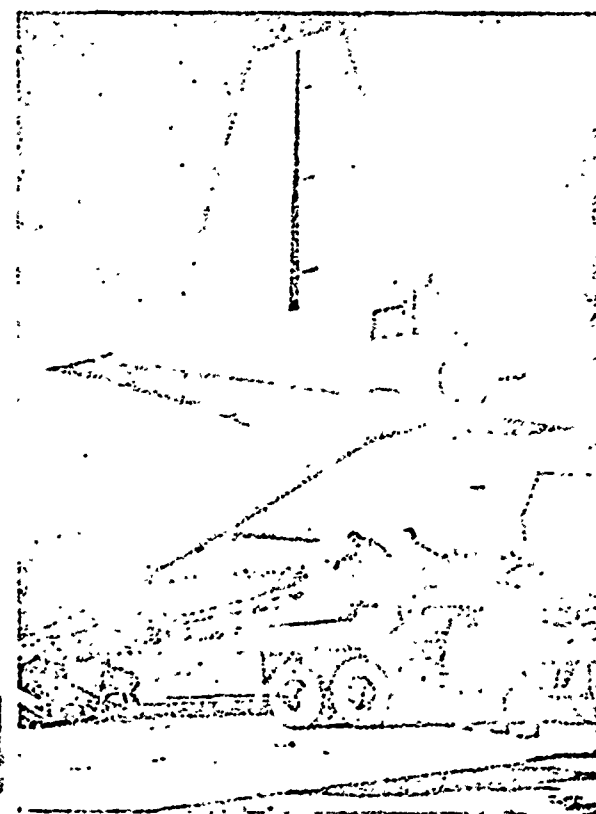
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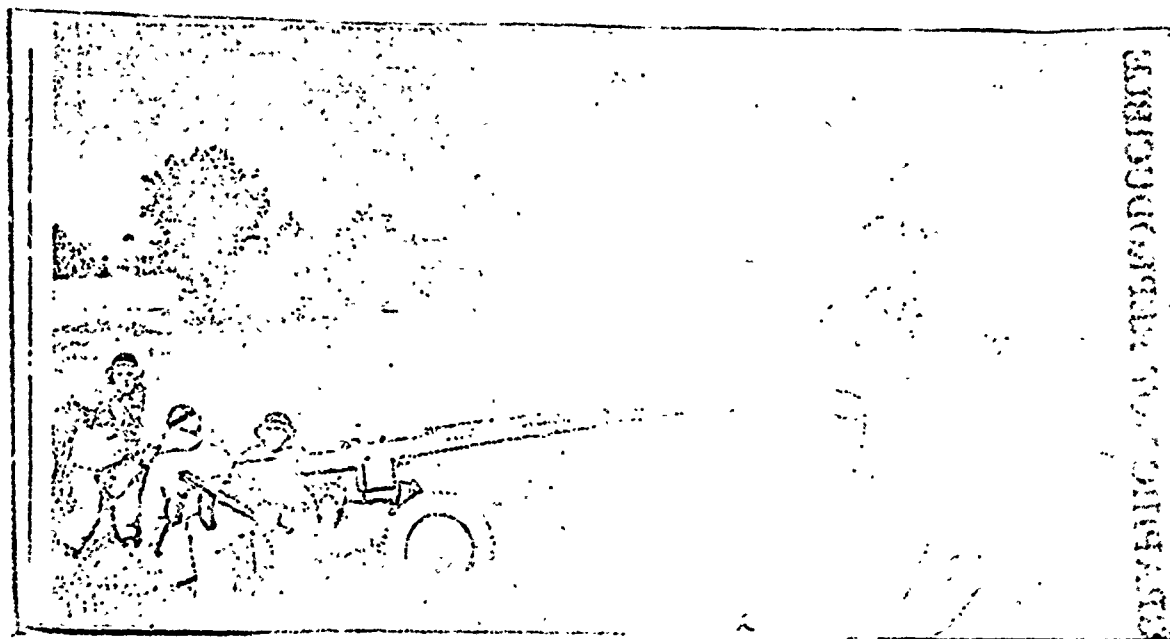
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After completing a long march the lead detachment of podrazdeleniye of the Hungarian People's Army moved secretly to the full-flowing Vltava and forced it from the march.



An air landing on a "seized" airfield.



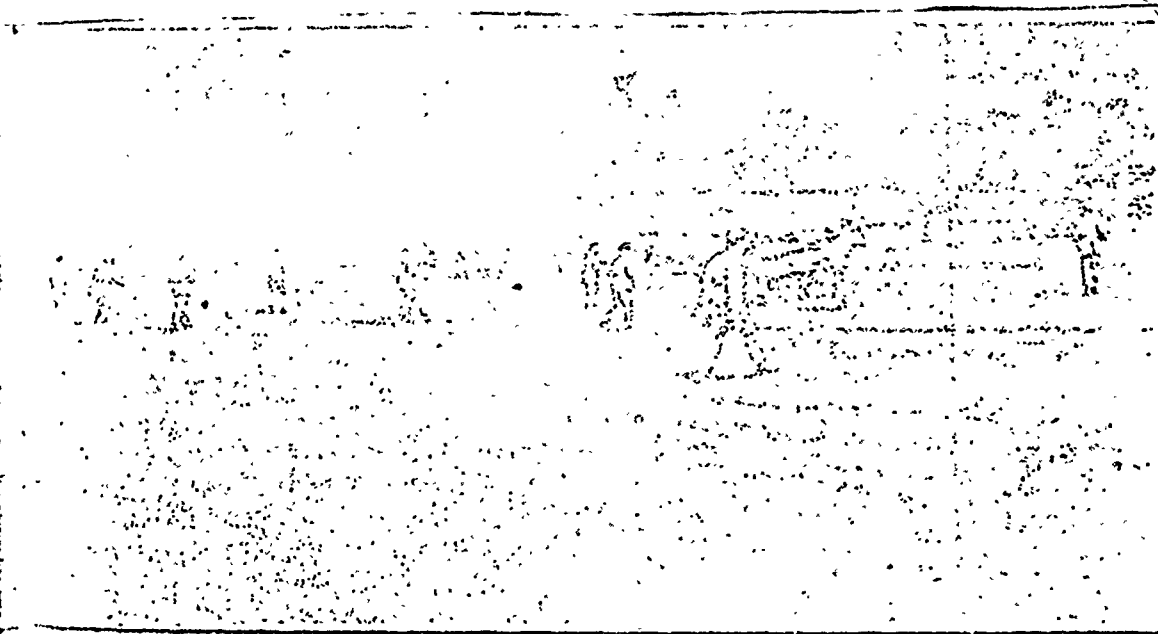
Combat is conducted by the winged Infantry of the Czechoslovak People's Army.

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Radio communication bears the brunt in a rapidly changing situation. During exercises the work of signalmen is made more difficult by language differences. However, all commands are received on time and accurately. In the photo: Czechoslovak signalmen in a mobile command post.



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Tekhnika i Vooruzheniye

Armament, Equipment, and Apparatuses

SELECTION OF INFRARED SIGNALS

(Based on materials in the foreign press.)

By Engineer-Captain 3rd Rank S. Korobasov

A heat-operated direction-finding apparatus which detects a target through target-produced infrared (IR) emission is based on the principle of determining the difference in heat levels between an object and the area around it. A heat-operated direction finder can be used to detect targets on and under the water and on the ground. The elements of a heat-operated direction finder constitute the basis of a target coordinator of infrared self-guidance heads for missiles and infrared sights.

It is known that any body, the surface of which has a temperature higher than absolute zero (-273°C), emits infrared energy to the space around it. For all practical purposes all objects which surround us, such as animals, people, military equipment, factories, plants, woods, plowed land, rivers, lakes, seas, oceans, the sky, clouds, and even the atmosphere are sources of infrared rays. Therefore, in principle it is possible to detect any object.

Sometimes the rays emitted by a background may serve as a source of false signals which, because of their magnitude, exceed the signals received from a target - the so-called useful signal. Calculations show that the intensity of emission from a portion of a sea's surface having a temperature of 17°C may exceed the intensity of emission of even a powerful source of radiant energy such as a surface ship. The intensity of energy emission from the sky, clouds, ground, etc. may sometimes be no less in magnitude. Signals from such backgrounds make it difficult and sometimes impossible to detect military objectives.

There are many methods by which useful signals can be identified (selected). Two of these methods are spectral and spatial selection. The difference between the spectral composition of infrared emission from targets and backgrounds and also between their geometrical dimensions lies at the basis of these methods.

As a rule, targets which are detected have different temperatures than do their backgrounds. Consequently, in accordance with Planck's radiation law the energy emitted by them spreads over a spectrum. The spectral characteristics of energy emitted by clouds which are illuminated by the sun, clear sky, the heated skin of an airplane, and the exhaust gases from airplane engines are shown in Figure 1, a.

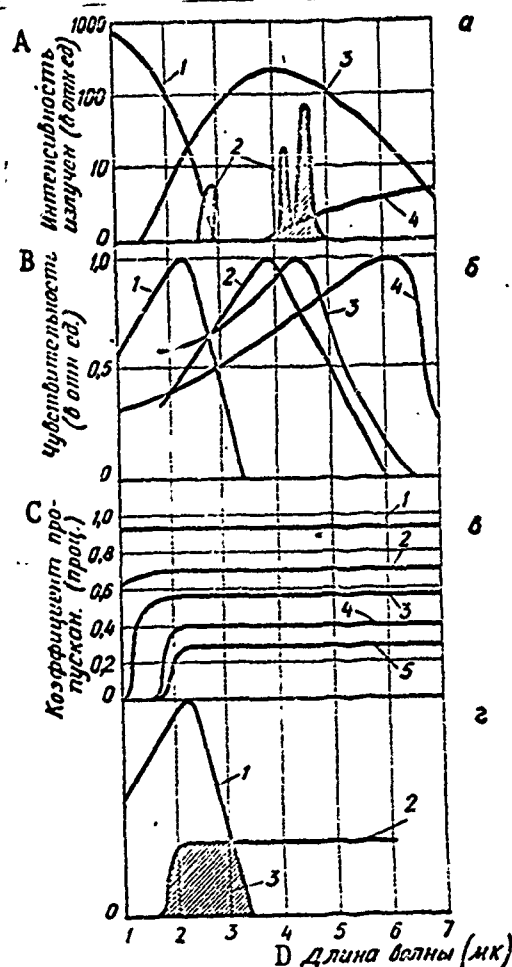


Figure 1. Spectral selection:

- a -- spectral characteristics of emission from background and target (1 -- sun's emission reflected from cloud; 2 -- emission from exhaust gases of an airplane; 3 -- emission from a heated airplane skin; 4 -- emission from sky (day and night);
- b -- spectral characteristics of radiant energy receivers -- photoresistors (1 -- PbS -- not cooled; 2 -- PbSe -- not cooled; 3 -- PbTe -- cooled; 4 -- InSb -- cooled);
- v -- spectral characteristics of energy passed through absorbing filters (1 -- quartz; 2 -- As_2S_3 ; 3 -- silicon; 4 -- germanium; 5 -- germanium + As_2S_3);
- g -- selection of signal from target (1 -- photoresistor of PbS -- not cooled; 2 -- absorbing filter made from germanium; 3 -- zone in which IX instrument receives signals from target).

LEGEND:

- A Intensity of emission (in relative units)
- B Sensitivity (in relative units)
- C Coefficient of transmission (%)
- D Wave length (microns)

The most important component of background emission may be direct sunlight or sunlight reflected from clouds. A large part (about 70%) of the energy from reflected sunlight falls in the visible sector of the radiation spectrum and the area close to it (1 micron). About 25% of the energy is emitted in waves 1 -- 3 microns long. Military targets, the temperature of which is much lower than the temperature of the sun, emit energy in wave lengths of one micron or more.

In this way the very nature of emission from detected targets and their backgrounds creates the necessary precondition for spectral selection of signals. This makes it possible to solve the problem of energy emitted by the background. To effect such a selection it is necessary first of all to select a radiant energy receiver. In the instruments under consideration so-called photoresistors are used primarily as receivers. These radiant energy receivers have varying sensitivity or, as it is said, discrimination with respect to emission of waves of different lengths. The spectral characteristics of several photoresistors are shown in Figure 1, b.

For spectral selection use is also made of the so-called optical filters -- devices which delay or weaken the flow of radiant energy in a certain area of the spectrum. Most often use is made of absorbing and interference filters. Absorbing filters for close IR rays are made from glass or colored plastic. They may be made from several semi-conductor materials such as silicon, germanium, and antimonous indium. The spectral characteristics of transmission of several absorbing filters are shown in Figure 1, v.

The principle of interference -- overlapping oscillations which have the same period but different phases -- lies at the basis of interference filter operation (its name indicates this). In the process of addition, oscillations in phase are strengthened oscillations out of phase are weakened. Interference filters are made by applying several layers of different kinds of materials of a certain thickness on a transparent base. By selecting the materials and the thickness of the applied layer it is possible to change the position of filter transmission boundaries and the value of the transmission coefficient.

A combination of radiant energy receivers and filters makes it possible to select a desired range of wave lengths. For example, by using a lead sulphide photoresistor and an absorbing filter made from germanium it is possible to select the energy emitted by the exhaust gases of an airplane engine within a range of 1.5--3.5 microns (Figure 1, g).

As we see, filters which absorb radiation consisting of waves less than one micron in length and photoresistors sensitive to waves having a length of one micron or more help reducing considerably the effects of solar radiation and at the same time most of the energy emitted by the targets is passed through and is received by the radiant energy receiver.

The method of spectral selection is most effective when the temperature of the background and the target differ. In this case the background and the object emit energy in different parts of the spectrum. However, the temperature of the object often differs very little from the temperature of the background. Therefore, to select the target signal it is possible to use the difference in the geometrical dimensions of the background and the target. As a rule, the dimensions of the background (sky, sea, clouds, etc.) are much greater than those of the target. This makes it possible to make use of so-called spatial selection.

Two methods for spatial selection of a target signal are known: by using a compensated radiant energy receiver and by using a modulating disk.

The compensated radiant energy receiver (Figure 2) may consist of two or more sensitive elements connected so as to oppose one another. The receiver is placed at the focal point of the instrument's optical system.

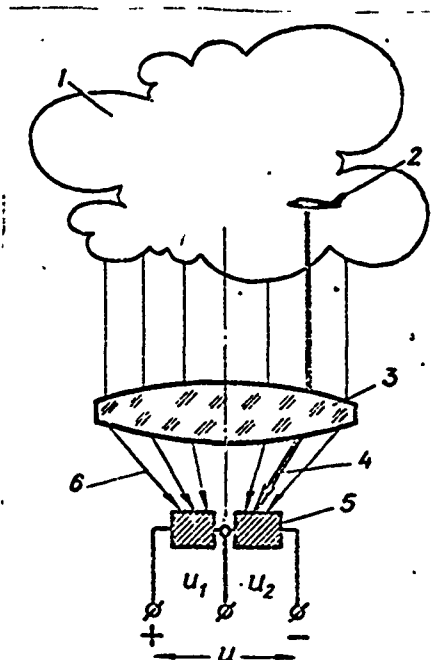


Figure 2. Spatial selection using a compensated receiver of radiant energy:

1 -- background; 2 -- target; 3 -- instrument's optical system; 4 -- emission from target; 5 -- compensated radiant energy receiver; 6 -- background emission.

Let us imagine that a cloud crosses the instrument's field of vision. The emission from this background "illuminates" the two sensitive elements equally. It follows that the voltages which occur in them are equal. In this case the voltage at the receiver output will be equal to zero. Let us now assume that a target appears in the instrument's field of vision. Inasmuch as its dimensions are relatively small the flow of radiant energy will "illuminate" only one of the sensitive elements. In this case the voltages on the left and right sensitive elements will not be equal. Despite the presence of background emission the instrument will record the appearance of a target.

A modulating disk (Figure 3, a) which consists of alternating transparent and opaque sectors (rasters) is placed at the focal point of the instrument's optical system in front of the radiant energy receiver. The width of the transparent sectors is so selected that the reflection of the target (the flow of radiant energy from the target focused by the optical system) moves freely between the opaque sectors.

As in the case considered above the dimensions of the background reflection (let's say a cloud) will be much greater than the dimensions of the target reflection. Therefore, the background reflection will

cover several rasters at the same time. It is completely understandable that the modulating disk, in rotating, periodically cuts off the flow of emission striking the radiant energy receiver. As a result, the voltage at the sensitive element output will be modulated. In this process the frequency of modulation of the target's signal is determined by the speed of rotation of the modulating disk and the number of opaque rasters. The frequency of modulation of the background signal will differ greatly from the frequency at which the emission from the target is modulated. The band filters mounted behind the amplifier will filter out the changing voltage which is caused by the target emission.

Incidentally, the frequency principle of identifying a target signal makes it possible to perform not only selection. Using the dual-caster modulating disk, the rasters on which are located in two concentric rings (Figure 3, b), it is possible to determine the position of the target with respect to the optical axis of the instrument. Such a disk is located in front of the radiant energy receiver so that the boundary of the raster rings is on the optical axis of the instrument. If the target is on a continuation of this axis there will be practically no modulation of the signal from it.

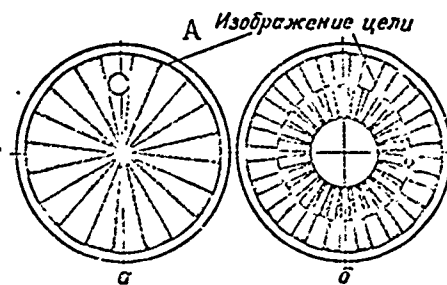


Figure 3. Spatial selection using a modulating disk:

a -- modulating raster disk; b -- dual-raster modulating disk.

LEGEND:

A - Reflection from target

If the target moves up or down the radiant flow is modulated at a particular frequency depending on which of the two rings contains the target reflection. The current pulsations in the circuit of the radiant energy receiver located behind the modulating disk will have a corresponding frequency. By providing in the instrument circuit two filters tuned to appropriate frequencies, it is possible to determine from the frequency at the instrument output which way the target moved.

Tekhnika i Vooruzheniye

ANSWERS

Officer R. TEREGULOV wrote the editors a letter in which he asked how the depreciation period of a motor vehicle is computed and whether the time taken to warm up an engine while a vehicle is parked is counted.

We received an answer to his question from the Central Motor Vehicle and Tractor Administration.

The amortization period of a motor vehicle is computed from the time it is put in operation and is recorded in the vehicle record. Repair of a motor vehicle ahead of schedule, for example due to an accident, may not serve as a basis for changing (reducing) the prescribed standards for distance to be covered. If a motor vehicle has not met the prescribed standards set for amortization distance and it is not advisable to repair it further, it can be dropped from records only after an inspector's certificate has been obtained and in strict accordance with existing orders and instructions.

Engine operation, for example, warm-up while the vehicle is standing, is not counted when computing the total time of vehicle operation with the exception of those cases when the vehicle is used to drive subassemblies mounted on other special vehicles.

The physical and chemical properties of fuel and lubricants affect the processes of atomization and combustion of fuel in engines and boilers and the degree of wear of parts and, consequently, the power and economy and reliability of operation of the mechanisms found in a power plant. Naturally, personnel who service shipboard mechanisms must have a clear idea of the importance of the main physical and chemical characteristics and check them when taking fuels and lubricants (GSM) on the ship and in the process of storing and using them. Specialists in the electromechanical department must be able to evaluate the quality of GSM under shipboard conditions and use means for cleaning them capably and on time.

In any oil product there always may be a certain amount of water and various admixtures. Water is contained in fuel and lubricating oil in the form of a simple mixture or emulsion. It lowers the calorific value of the fuel, causes corrosion of metals, and sometimes leads to mechanical damage to engines and boilers. In heavy fuels the water content is higher than in distillate fuels. The possibility that seawater may get into fuels or oil cannot be precluded. This has an extremely harmful effect on engine operation. Therefore, fuel and oil on ships must be checked systematically for salinity and they must be carefully cleaned.

Mechanical admixtures (sand, clay, iron oxides, and particles of coke) get in fuel and oil from initial oil products in the refining process and also during transportation and storage. These extremely undesirable admixtures in fuel or lubricating oil lead to increased wear on jets, parts, and subunits.

The ash which forms following fuel combustion contributes to abrasive wear in the cylinder-piston group and some of its components, for example Va_2O_5 , cause corrosion of parts. The following example may be presented. Let us assume that a 2,000-HP engine consumes 400 kg of fuel per hour which contains 0.1% of ash. In a period of 30 days of uninterrupted operation during a long cruise 288 kg of ash pass through the cylinders of the engine ($400 \times 24 \times 30 \times 0.001$). Unquestionably the condition of the cylinders and the rings in such an engine will be impaired.

Along with the physical and chemical properties of fuel and lubricants indicated above there are many others of no less importance such as viscosity, acid number, flash point, heat-producing capacity, and so on. They can be checked from documents (on a ship) or in a laboratory (in shore GSM laboratories).

When checking GSM from documents, the main physical and chemical indicators of the fuel or oil according to the certificate issued by the fuel center are compared with the demands of rules pertaining to maintenance or the instructions from plants which produce power plant engines. The check is made by the electromechanical podrazdeleniye commander. He draws the conclusion as to the condition of the fuel or oil, gives permission to take it on board, and decides the route of flow and procedures for taking samples.

It is important to check the quality of GSM in shipboard tanks not only while at anchor but also very importantly during preparations to take the ship for a cruise or into combat and also during a cruise, especially in stormy or cold weather.

Rich experience in checking the quality of GSM has been acquired on the ships where Engineer-Captain 2nd Rank Yu. Gromtsev is the flagship engineer-mechanic. Here for this purpose they use an ordinary shipboard water-chemical laboratory (VKhL) which contains the necessary attachments, devices, and reagents. Personnel are taught how to take samples in a GSM

base laboratory. Two or three periods are required for such instruction.

Samples of fuels and lubricants are taken two hours prior to preparing a ship for a cruise. During a cruise samples are taken from the fuel tanks which are in use once during every watch and from reserve tanks once per day. The oil is checked every time the separator is started. Fuels and lubricants are checked for the presence of water and its salinity. This is especially important since water may get into a tank through an air pipe from an upper deck, through the warm-up coil pipes, as a result of bulk-head sweating, and so on.

GSM are checked for mechanical admixtures when they are taken on board, after long storage, after disassembly and repair of machinery, or after a system is pumped through (if the oil or fuel is changed), and also in the event the filters or separators break down.

Understandably the tasks performed by personnel are not limited to checking the quality of fuel and lubricants. It is necessary to remove mechanical admixtures and water from fuel and lubricants.

Three ways are used to clean fuels: settling in special tanks, separation, and filtering.

Settling is done over a period of 20--24 hours. For this purpose, as a rule, one tank is set aside on each side of the ship. The capacity of such a tank should provide for operation for about 24 hours.

To achieve the best possible settling, fuel, especially heavy fuel having great viscosity, is heated in a tank to 50--60°C. At such a temperature the suspended particles settle easily and water separates well. Settling is a rather effective method for cleaning and is widely used due to its simplicity. Separation results in the most complete cleaning. Separators of the centrifugal type are used on ships.

Shipboard separators*, as is known, may work in two regimes: as clarifiers (brighteners) and as purifiers (cleaners). [* What is meant here is separators which are mounted on ships of old design.] In the first instance they remove mechanical admixtures and ash and in the second they remove water. Experience shows that most often separators are used for operations in the second regime. If there are two separators in a machinery compartment it is most advisable, from our point of view, to connect them in series (Figure 1). The separator which works in the clarification regime will serve as a kind of protector against loss of oil products which may be discharged with the water if the washer of the purifier is incorrectly selected and, moreover, it simplifies checking the cleaning regime. Practice shows that a separator-purifier works well only when the regulating (gravitational) washer corresponds to the specific density of the oil product. If the diameter of the washer opening is too great then fuel (oil) will be discharged along with the water and if it is too small then the effect realized by the separation process will be greatly reduced. Gravitation washers are selected in the following way. Washers of ever-increasing opening diameter are mounted on the separator one after the other until the point is reached where fuel (oil) is not discharged along with the water. The last washer is then replaced by the preceding one (of smaller size). It will be the most suitable one. In this case the surface of the "fuel-water" phase divider will be between the edge of the drum dividing plate and the maximum diameter of the working plate. As a result the fuel or oil will pass through the entire packet of plates and the effectiveness of cleaning will be greater. A lower viscosity of the fuel or oil improves separation and therefore they must be preliminarily heated to a temperature of 75--80°C. (However, this temperature should not exceed the flash point.)

Lately the so-called self-cleaning separators which clean without being opened (see the insert) are finding wider use on ships. They are

convenient to operate and have greater capacity. Their life is somewhat longer than is that of ordinary separators.

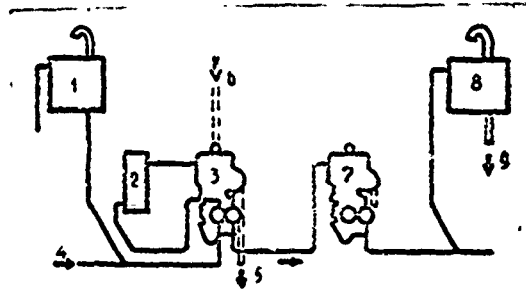


Figure 1. Diagram showing how to connect separators in series:

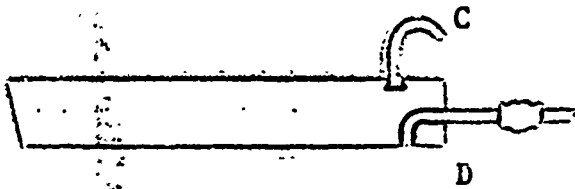
- 1 -- settling tank with preheater;
- 2 -- separator preheater;
- 3 -- separator-purifier;
- 4 -- dirty fuel (oil) from spare tanks;
- 5 -- flow-off to drain tank;
- 6 -- delivery of hot fresh water;
- 7 -- separator-clarifier;
- 8 -- service tank;
- 9 -- delivery of fuel (oil) to engine.

^ self-cleaning separator has a flow meter, a device with a constant pressure valve for circulating the fuel, a preliminary filter, and an autonomous preheating system.

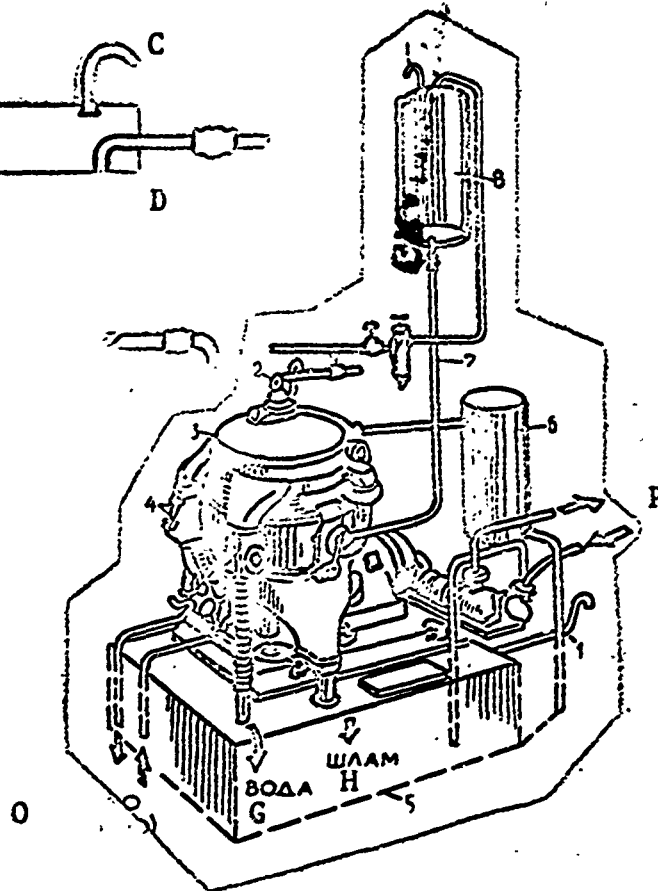
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A

B



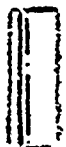
E



I

J

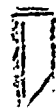
K



L



M



N

Legend:

A Cleaning fuels and lubricants	I Filtration
B Settling	J Coarse cleaning
C Air	K Fine cleaning
D Two engines	L Mesh filter
E Water and sludge	M Capacity filter
F Separation	N Centrifugal filter
G Water	O Oil (fuel)
H Sludge	P Off-board water

Filtration is used to clean GSI on all ships in the fleet. Oil and fuel filters are usually paired so as not to stop the power plant for cleaning and repair. In design they may be surface, slit, capacity, or centrifugal (centrifuge). The most widely used in shipboard power plants are the surface and capacity filters. The filters are cleaned once every watch.

Surface filters (Figure 2) are used for coarse cleaning in order to remove the coarsest mechanical admixtures. Such filters can have cylindrical or disk screens, the mesh of which measures 0.14 X 0.14 -- 2.0 X 2.0 mm.

Surface filters have great hydraulic resistance, are simple to operate, and can easily be disassembled and cleaned. During operation it is necessary to check the condition of the screens.

A typical slit filter consists of a set of relatively thin plates (0.25--0.3 mm) the gap between which is 0.1--0.18 mm. Such filters catch particles up to 40 microns in size. Their shortcoming is buckling of the plates (this reduces the filtering effect).

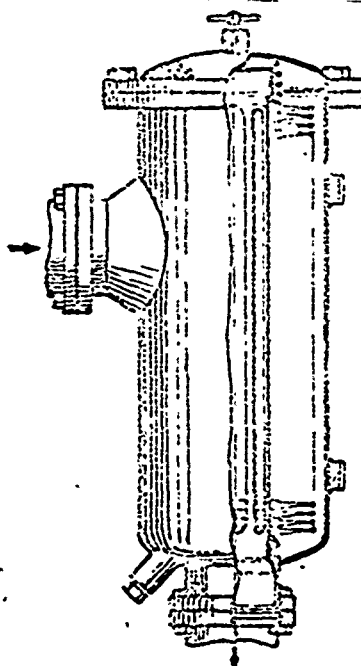


Figure 2. Filter for coarse cleaning.

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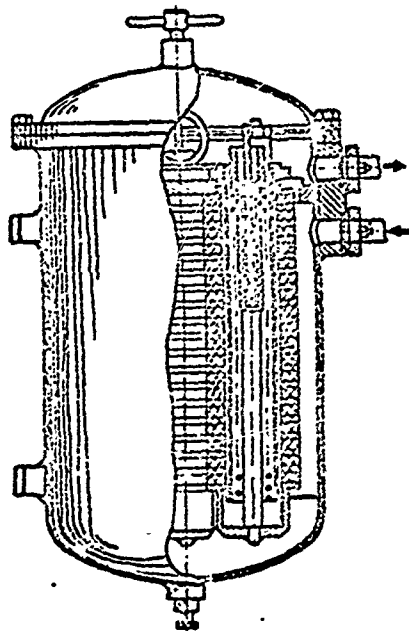
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Slit filters are also used for coarse cleaning of oil and fuel. The filtering elements, as a rule, are shells on the outer surface of which is wound either a special filtering band (the gap between the turns of which is usually 0.03--0.13 mm) or a fine wire (diameter 0.3 mm) with the gaps between the turns measuring 0.1 mm. The filters remove particles measuring up to 10--15 microns from the GSM. In engines which use heavy fuel they can be mounted directly at the jets.

Capacity filter is the name usually given to those in which the entire mass of the filtering material is used to hold foreign admixtures. These filters are used for fine cleaning of fuel and oil (Figure 3). They remove particles measuring 3--6 microns from the fuel or oil. Porous materials are used for the filtering elements.

Felt filters have become the most widely used since they are rather simple in design and have good cleaning ability. Filtering elements made from domestically produced materials have a sufficiently long life (see the table) if the pump pressure described by instructions and the fuel or oil warm-up temperature in front of the filter are strictly observed.



GRAPHIC NOT REPRODUCIBLE

Figure 3. Filter for fine cleaning.

Model of Diesel Engine on Which Filter is Installed	Characteristics of Filtering Material	Pumping Pressure in kg/cm ²	Life, in hr
YaZ-204	Artificial rock wool. Element liner made from gauze.	4.7--6.0	40--50
4Ch10.5/13	Thin-wool felt, Type FT, internal cowlings made from coarse calico (thin cotton or linen is permissible).	0.5--0.6	170--220
D6	Thin-wool felt, Type FT and Type FT. Inner cowlings made of wool netting.	0.5--0.7	230--280
2Ch8.5/11	Thin-wool felt, Type FT or Type FT. Inner cowlings made of wool netting.	0.5--1.0	270--450

Lately wide use is being made of the so-called combined filters for coarse and fine cleaning (Figure 4). The first (right) filter through which the fuel (oil) flows is the coarse cleaning filter. The net (or fabric) drawn over the metal shell is the filtering element. The second (left) filter is the fine cleaning filter and it has a special absorbing element made from a filtering material contained in a perforated metal jacket. Filters of this design make it possible to decrease the number of filters in a power plant. Checking and caring for them is much simplified.

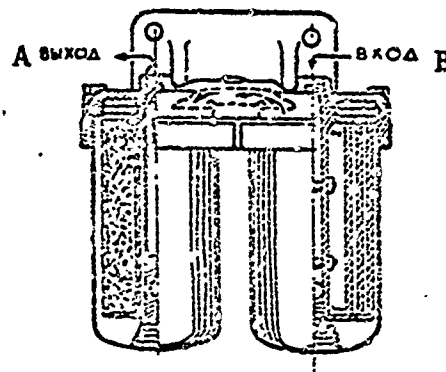


Figure 4. Two-stage combined filter for coarse and fine cleaning.

Legend:

A Discharge

B Intake

Careful checking of the quality of fuel and lubricants and also timely and wise use of cleaning equipment provides for long and reliable operation of material and yields great savings in fuels and

lubricants and other materials. Thus, on the ship where Engineer-Captain 3rd Rank G. Khalimanovich is the senior engineer-mechanic, the yearly savings in GSM reaches 10--12% of the annual limit.

In this a great deal of credit goes to shipboard innovators whose suggestions helped improve the fuel and oil systems and the cleaning equipment. For example, now the dirty oil and water which comes from the separators is not poured in the hold but collected. Also the service oil and fuel tanks have been improved. While formerly water was removed and a test of the oil and fuel taken from the system, now this is done directly from the tank.

Shipboard innovators and inventors are able to accomplish a great deal. It is only necessary to guide them in their work. For example, universal cleaning devices based on an ultrasonic principle and an electrostatic field can produce a very great effect. Such devices clean not only fuel and oil but also hold and ballast water.

Wise and effective use of fuel and oils on a ship increases greatly the economy of operation and the reliability and life of power plants.

* * *

In the insert: self-cleaning separator (1-- ventilation pipes; 2 -- flow meter; 3 -- control valve; 4 -- inspection windows; 5 -- sludge tank; 6 -- pre-heater; 7 -- fresh water delivery pipe; 8 -- service water tank.)

* * *

Technical TrainingCLARITY MEANS INTELLIGIBLY

By Captain 2nd Rank M. Kuklin

A young officer who not long ago completed a naval school was conducting instruction on the subject: "Design and Operation of a Recoil Brake on an Artillery Mount." Moving his pointer along the cylinder of the brake (the instruction was being conducted at a gun in a combat post) he spoke with knowledge of the shape of the cylinder and other parts and of their interaction. The sailors listened closely and with great intentness. They tried to imagine these parts to themselves and understand their design and functioning. However, their attention soon began to fade. The listeners began to talk among themselves and to look about. They lost interest in the instruction. The battery commander sensed this. He began to grow nervous and became confused in his words and thoughts. By the end of the lesson things were wan and dull.

What happened? The instructor thought that the subject of the instruction was simple and that he could explain it understandably and therefore no training aids were needed. In preparing for the instruction he was not interested in whatever training aids on the subject were available on the ship. And at the same time on the ship there were diagrams and colored charts of the recoil brake and even charts of separate parts. Had the officer used these visual aids the instruction would have been more lively, interesting, and intelligible.

Although such errors are rare they do happen even with the more experienced officers. The instructor in the naval department at one higher educational institution, when explaining the functioning of a torpedo apparatus on a submarine, showed the interaction of mechanisms when the break-water shield and the forward lid of the apparatus were opened by using two magazines. This looked about as follows. "The lever goes here," said the instructor and he moved one of the magazines away from himself. "And the thrust goes to the left," he said as he moved the other magazine to the left. Clearly the trainee could not benefit from this kind of "clarity."

If for some reason it is impossible to demonstrate the actual mechanism or depict its schematic diagram on a chalkboard it is better simply to say "the lid and shield are opened using a system of levers" than to use one's fingers to demonstrate it. But it would be best of all to use a mock-up. Incidentally, a mock-up sometimes presents a real advantage over actual equipment. Its dimensions are not very great and it is convenient in use at instruction.

Clarity in an exercise can be achieved by using very many different means. Direct demonstration of the things being studied is widely used. Thus, during instruction conducted in a combat post the trainees gain an impression of the instruments and mechanisms which are being studied. For example, sailors see right in front of them a mine, diesel engine, etc. At instruction the instructor must identify and emphasize in an object being demonstrated that which is most important and not distract attention to secondary details. It is desirable that an instrument or mechanism be perceived simultaneously by different sensory organs and that trainees get an impression of the size, color, weight, and so on. If conditions permit it is necessary to show a mechanism in operation. In thinking over how best to use an object for demonstration an officer must also plan his exercise so that the trainees will have enough time to observe the object. At the same time he must not leave the parts and instruments where they can see them all during the instructions. By becoming interested in the object they will miss what is most important. As a result the instructor will lose contact with his audience.

Various kinds of drawings, charts, maps, posters*, tables, film strips, movies, and so on impart great clarity to instruction. [* In the remainder of the article the word "poster" will refer to drawings, charts, diagrams, and so on. 7 In many cases it will be impossible to comprehend the essence of a phenomenon without these aids. Thus, in studying the interaction of parts and mechanisms of a particular gun it is impossible to see their position at any particular moment. And in order to use equipment wisely it is essential to understand the interaction of the various parts. Here it is advisable to use posters on which the parts and mechanisms of a gun and their mutual position with respect to one another at the most critical instants can be shown.

Posters are also convenient because on them it is possible to show only those parts which must be shown for an understanding of the problem. Excessive detail distracts listeners and hinders them from understanding the content of instruction thoroughly. It follows that in each training aid, as in the speech of the instructor, there must be nothing extra which clouds the principal content. The main object must stand out from the general background of the poster, that is, from the objects surrounding it. This simplifies comprehension. But the poster should not be too primitive or too flashy. Clarity and intelligibility of representation can be achieved by a correct selection of the scale and methods of representation and by precise identification of what is most important.

In Figure 1,a there is shown a device for straightening bent sheets of hull lining. (This drawing was used at a period of instruction.) At first glance it may seem that the straightening is done by turning the nuts, 1 (the numbers for the parts are added by the author of this article) on the lead screws, 2. What was our amazement when we learned that the sheets in this case are straightened by using a jack, 3. One would have to have a tremendous imagination in identifying the part identified as No. 3 as a hydraulic jack. The principal object on this poster should have been the jack and it should have been made to stand out. Then the trainees would have understood at once the essence of the process by which bent sheets are straightened in this manner (for purposes of comparison the jack is shown more clearly in Figure 1,b).

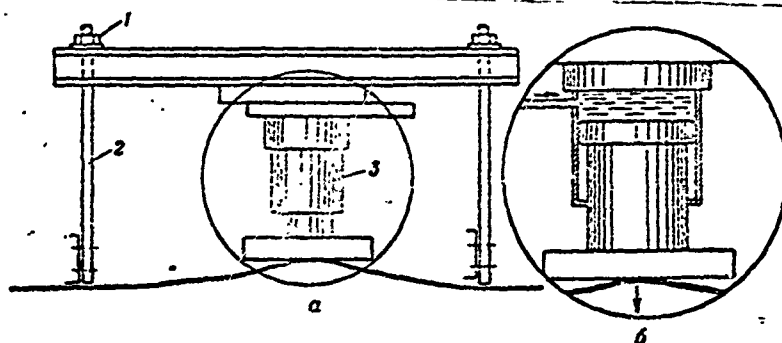


Figure 1.

Figure 2 also cannot stand close examination. We will not make mention here of all the shortcomings. Suffice it to say that the forces acting on a sheet of metal are not indicated by letters. Therefore, the instructor must orient his students with such expressions as "this force acts this way and that force downward..." Such a presentation of material is methodologically unsound. The instructor should designate one force, for example, with the letter "F" and another with the letter "R". And then all would fall into place. The instructor's

thought will be precise and specific when he says "...Force F acts downward in the direction of the blow and force R acts upward..."

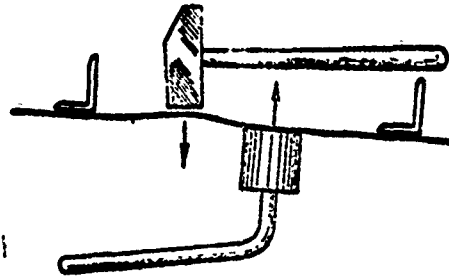


Figure 2.

We will point out that such simple charts should not be made in the form of posters since an instructor may draw them quickly on a board during the instruction and this contributes to better mastery of the material.

Preparing posters requires a certain amount of preparation. In this work an experienced officer who is an expert in methods of instruction must take part. For each special course it is necessary to think through an entire set of posters at once since creating training aids must not be done haphazardly.

In organizing the preparation of training aids it is necessary to base oneself on the purposefulness and actual need of them. Visual aids are not created for the sake of beautifying offices and laboratories. It is true that there still occur instances when posters, mock-ups, and other much more complex aids which are not needed are created for the sake of eyewash. It seemed that a good mock-up of a mine field had been made in a chast'. But only a few minutes are allotted to this subject in the training program for specialists and trainees in the chast'. At one exercise the instructor said: "Mines are set opposite ships, banks, lines, fields, and so on..." And this terminated the conversation about mine fields. For the sake of illustrating this brief bit of information a mock-up costing 133 rubles was made in a workshop. There was no clear need for this training aid. This is evidenced by the fact that it stood for over three years in an office where no instruction on mines is ever given.

In one of the military chast' personnel are trained to service ship power plants. Acquainting specialists with the general principles governing communication and observation in the fleet is included in their training program. About one training hour is allotted to questions of radio communication. During this period of time the instructor acquaints his trainees with the tactical capabilities of means of communication and block diagrams of receiving and transmitting devices and their technical data. As we see the mission is a very modest one. However, to ensure clarity in instruction this chast' was issued a radio relay set with a radio receiver. Was it really necessary? Of course not. The instructor simply did not have the time to demonstrate this apparatus and talk about it, especially since there was no provision for this in the program. In our opinion, such visual aids are unnecessary and contrived and they lead to an unnecessary expenditure of government money. Where something like this is actually needed even larger amounts of money should be spent.

These two examples confirm the point that it is necessary first to think through all the material that is needed for instruction and then to make the training aids. A young instructor should be prevented from making other blunders. Prior to a period of instruction it is necessary to check to see whether separate subunits and parts are depicted correctly on posters and whether the requirements of state standards are observed.

The methods used in showing posters are of no little importance. Prior to demonstrating a training aid the instructor must prepare his trainees to perceive it and set before them a goal to be reached by observation. In the process of showing the poster he draws the attention of his listeners to perceiving the visual aid as a whole and also in its several parts. If necessary he gives the trainees a chance to draw some of the charts. However, posters which are put up should not be left in view until the very end of the period of instruction. They must be taken away just as soon as the need for them passes. The instructor should take them away also even if he will need them again. At the same time it is necessary to bear in mind that changing visual aids too rapidly hinders the efforts of listeners to analyze them and remember details. Sometimes an instructor will put up a poster and will not even mention it during the course of his instruction, thinking that he has achieved clarity in instruction. It is also recommended that all posters which will be needed during the course of instruction be put out all at once. In such cases the attention of trainees is scattered. When trainees have had a chance to see a training aid ahead of time they lose interest in it.

It is advisable to show several posters at once only when there is need to compare their contents.

An epidiascope which makes it possible to project opaque pictures directly from a book and also drawings made by an officer on a chalk-board during instruction can be of great help during instruction. When making drawings and charts and at the same time explaining material, great clarity and better understanding of material can be achieved. Close contact is established between the object being drawn and the speech of the instructor. This increases interest in instruction, sharpens the attention of listeners, and leads to lively perception and firm mastery of the material covered. Graphs and charts which are made on a board must be done very accurately. Well-trained young men are now entering the Army and Navy. Young soldiers and seamen know the basic principles of drawing rather well and notice readily the mistakes made by an instructor. Poor ability in drawing inevitably detracts from the attention of listeners, lowers the quality of instruction, and does not contribute to the prestige of the instructor. Therefore, prior to an exercise an instructor will benefit from rehearsing his presentation once more. In making drawings on a board it is necessary to adhere strictly to the symbols which are used in a particular discipline and also the symbols defined in all-union standards.

If an instructor wants to show the parts of a mechanism in different positions then he must make several drawings. Any new position of parts in a mechanism should not be drawn over the preceding drawing. We will compare Figures 3 and 4 in which strokes (intake and exhaust) of an internal combustion engine are shown. In Figure 3 we see two processes immediately. First the instructor drew the intake process and then, when he went on to speak about exhaust, he drew the exhaust process. By so doing he wanted to save time. As a result he had a drawing which was difficult to understand and only made it difficult to master the material. In Figure 4 the same two processes are shown separately. It is easy to see that this is much better than the procedure used in Figure 3.

Training films are of great benefit to an instructor. Films have great technical capabilities. They make it possible to change a time frame. Extremely rapid processes can be shown in slow motion (for example the firing of an artillery round, the action of a shock wave, and so on) and, on the other hand, extended and little noticed processes can be accelerated.

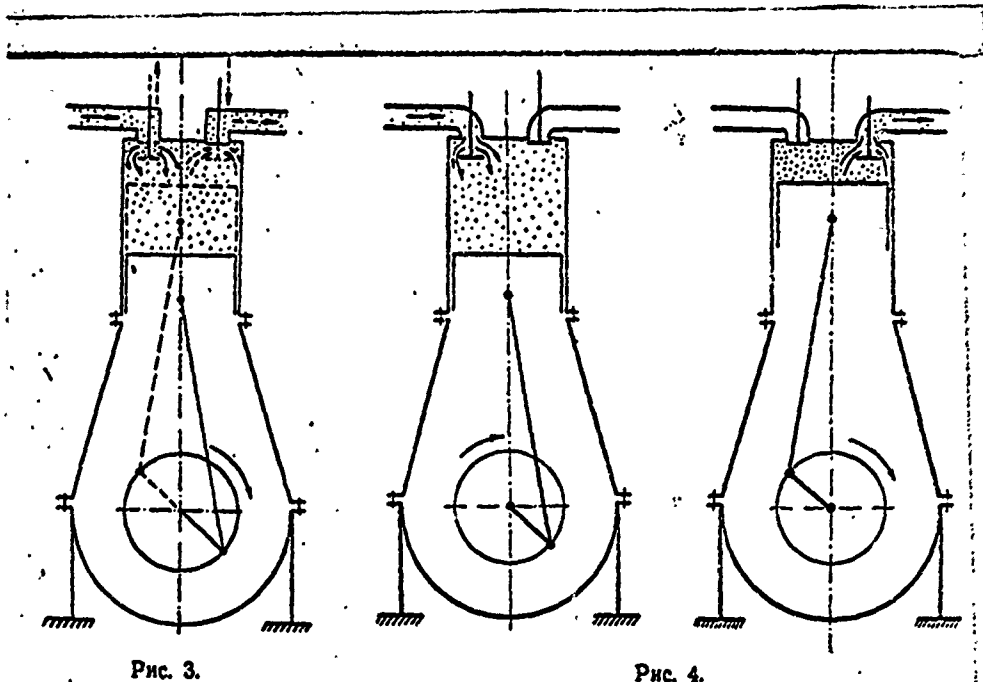


Figure 3.

Figure 4.

Methods to be used in showing films at instruction must be well thought-out. A film should be included in a plan of instruction depending on its contents. It may be shown after one or several periods of instruction devoted to the same subject. Usually a film should not last longer than one hour.

The previous experience that trainees have and reference to specific models and ideas which are already known are of great help in mastering complex subjects. For example, in taking part in installing or taking apart main turbines sailors saw, "felt," and attached the parts of these mechanisms with their own hands. Later at instruction on the subject "a ship's main engines," by glancing at the drawings and charts they easily recalled the appearance of main engine parts, their shape, and the way they were attached. From this it is apparent what great importance is had in the training of personnel by actual participation in the work done to take apart, repair, and assemble subunits, mechanisms, and instruments.

Clarity, we are convinced, has a great importance in training personnel. Therefore, officers must not only improve their skill in using visual aids but also get their non-commissioned officers to do so.

AN ELECTRONIC COMPUTER

By Engineer-Colonel A. Malinovskiy

An electronic computer, Model Dha, which is distinguished by its simplicity and reliability, has been designed in the German Democratic Republic. It was on exhibit at the Leipzig Fair and received a high rating. Its length is 60 cm, its width 42 cm, and its height 45 cm. It weighs about 71.5 kg.

The operating memory device is a magnetic drum with a capacity of 4,096 elements (words) and there are 33 binary digits in each element. The drum rotates at a speed of 18,000 rev/min (it is expected that the speed will be doubled in the future.) It is divided into 32 sectors and has 128 tracks. The computer uses transistors (200 each) and germanium diodes (1,900 each) and it can perform operations of adding, subtracting, multiplying, and dividing and also various logic operations. Processing information is done by series at a working frequency of 316 kcps. The maximum speed of computation is 2,400 operations per second.

The data may be inputted using a keyboard or a perforated tape. Information is outputted on a tape. The speed of input is 50 symbols per second and of output 25 symbols per second. Each command consists of an address (number of sector and track) and the symbol of the operation divided into four independent parts: the type of command, the nature of the operation, appeal to operating memory, and erasing. The operating cycle for carrying out a command contains four tracks and is done automatically.

In order to get an idea of how the Dha computer differs from other electronic computers and its distinguishing features we will consider briefly the logic involved in carrying out commands.

The contents of the register of the instructor counter are transmitted in the first track to a 12-row address register for selection of the correct element in the operative memory. During the second track the command being carried out is selected from the operative memory device. Between the first and second tracks a period of waiting is provided for if the digits called from the memory device are not decoded immediately. During the third track the command addresses are relocated. Then, if there is no command to stop, the computer returns to the first track or switches to the fourth track during which the operation set on the register is performed.

The Dha computer will find application for solving a wide range of problems in different fields of science and technology.

BECOMING A DRIVER

By Engineer-Colonel V. Zelenskiy,
Lecturer, Candidate of Technical
Science.

Every year many inductees come to the ranks of the Soviet Army who are qualified drivers but who have not received training in driving military vehicles. Therefore, they first go through the course for the young soldier and then they are sent to special assemblies.

So that those who participate in these assemblies acquire the necessary skill, particular attention must be paid to the selection of instructors to handle their practical work in driving. It is important that these instructors be experienced and disciplined sergeants who have completed schools for training driver instructors and who are able not only to evaluate correctly the actions of trainees but help them master certain procedures in driving a motor vehicle under the most difficult conditions. It is advisable to assign soldiers on extended duty as instructors and to assign officers from the motor vehicle and tractor service for handling the most complex exercises.

However, it is not enough just to assign instructors. Sometimes it happens that under one pretext or another they are released from conducting the instruction. So that this not happen, in one of our chast' it was specifically stated in an order that commanders were obliged to allow instructors time for preparation and they were not to send them away on temporary duty or use the hours of instruction for any other purpose.

Usually at assemblies several groups are set up of platoons which are being trained in accordance with a single program which provides for extending the knowledge drivers have of motor vehicle design and rules for operation and repair and for improving skill and practical driving. Hours are set aside for studying the organization of the motor vehicle and tractor service, tactical and firing training, and mastering the procedures used in defense against weapons of mass destruction. Soviet Army regulations and instructions are studied as well as the rules of motor vehicle transport and other subjects. This all has great importance in training a military driver. However, in this article we will discuss only a few of the aspects of special training.

The content of instruction at assemblies and also the number of hours allotted to driving and studying motor vehicle operation and traffic rules are prescribed by the program and they cannot be changed. It is only possible to redistribute the time used to perform different exercises and also to set aside more driving time for young drivers at the expense of those who are better trained. Each young driver must practice all the exercises prescribed by the program. It is very important to devote particular attention to driving under conditions which are characteristic of military motor vehicle movement such as movement cross-country and over snow-covered fields, over badly rutted roads at night using illumination devices, and also across water obstacles and other types of obstacles and barriers. It is also necessary to have officers in the motor vehicle and tractor service personally check the quality of practical instruction in driving.

Those commanders who permit omission of certain exercises although the total number of hours of practical driving is not decreased are proceeding incorrectly. Thus, at one of the assemblies only one-sixth of all exercises were practiced. 14 periods of instruction were conducted at which trainees drove 23--25 hours each. However, each exercise makes it possible to cover only certain elements of the driving process. If, say, Exercise No. 12 has as its purpose teaching young soldiers to drive a motor vehicle with a trailer under difficult conditions, Exercise No. 6 makes it possible to train them only in crossing the various kinds of

fortifications and barriers often encountered under combat conditions.

The instructors in charge of assemblies should devote attention to providing training in vehicle driving at night using illumination devices. The fact of the matter is that drivers who are trained and who have worked under non-military conditions have not, naturally, studied military equipment which is used and have not acquired practical skill in using it.

In going through the program of assemblies young drivers take tests on the subject of Traffic Rules and Vehicle Driving. Here their ability to perform maintenance on a motor vehicle is checked. The tests are given by chast' commissions. The results are announced in a chast' order. Then the soldiers who have completed the training successfully take part in a long march which concludes the pre-training of a military driver. This march is good practice and furthermore it makes it possible to check a driver's ability to work with the vehicle assigned to him.

Organizing the march and bearing responsibility for it is charged directly to the chast' commander. After selecting the route from a map and performing a personal reconnaissance, the commander determines the nature of certain sectors and places for halts and rests and he selects sectors over which the vehicles will move at night observing various light discipline measures (see the table).

Проводимые мероприятия	Время
Подготовительный период (подготовка к маршу, занятия по теме «Работа водителя при подготовке к маршу и устранение неисправностей»)	
Начало марша	20.00
Малый привал	22.00—22.30
Малый привал	0.30—1.00
Отдых, ежедневное обслуживание, занятие «Обнаружение и устранение неисправностей в полевых условиях», инструктаж	4.00—14.00
Малый привал	17.30—18.00
Движение в средствах индивидуальной защиты	—
Привал и прием пищи	20.00—23.00
Движение на режиме частичного затемнения	—
Отдых, ежедневное техническое обслуживание, занятие «Подвижные ремонтные средства», инструктаж водителей	2.00—16.00
Большой привал, прием пищи	19.00—23.00
Движение на режиме полного затемнения	—
Привал	2.00—4.00
Движение без света фар	—
Возвращение в часть	—

Measures Taken	Time
Preparatory period (preparation for march, instruction on the subject "Work of Driver in Preparing for a March and Eliminating Malfunctions")	
Beginning of march	2000
Short halt	2200--2230
Short halt	0030--0100
Rest, daily maintenance, instruction on "Detecting and Eliminating Malfunctions under Field Conditions," briefing	0400--1400
Short halt	1730--1800
Movement while wearing individual protective clothing	--
Halt and meal	2000--2300
Movement under conditions of partial blackout	--
Rest, daily maintenance, instruction in "Mobile Repair Facilities," briefing drivers	0200--1600
Long halt, meal	1700--2300
Movement under conditions of complete blackout	--
Halt	0200--0400
Movement without headlights	--
Return to <u>chast'</u>	--

The route is so selected that not less than 40% of it will pass over dirt roads and not less than 10% over roadless areas and sectors covered by snow and also so that not less than half the route is covered at night.

After a personal reconnaissance the commander gives the order for the march. In it he indicates the goal, the way in which teaching points will be covered and practiced, and the composition of the column. He names key people and indicates the route of march, the length of the route of march, and especially the time and place of the night (day) rests and the short and long halts. He gives instructions about organizing column control, regulating movement, and organizing feeding and rest for personnel. He designates the initial point and the time at which it must be passed. He specifies the composition of the column maintenance closing files and their missions.

In conclusion, he sets forth the demands for march discipline. It is advisable to attach the march plan to the order with an indication of the places of halts, rests, and feeding, sectors of movement observing various light discipline regimes, and the average speeds of movement. It is best to conduct the march against a tactical background in order to bring it as close as possible to actual combat conditions.

The maintenance plan is based on the order issued by the deputy commander for materiel. Most people think, and probably correctly, that the plan can best be drawn up on a map. On the map the route, the places of halts and the rests, maintenance measures, and procedures for arranging the column, and closing files and their missions are indicated. Assignment of prime movers to certain sectors along the route which can be passed only with difficulty and means for evacuation to railroad crossings are indicated here. The commander approves the maintenance plan which is worked out and shown on the map.

Concurrently the deputy commander for rear services organizes administrative and supply aspects of the march. Vehicles for transporting fuels and lubricants, firewood, and food, the field kitchen and the cooks, and heatable tents for personnel to rest in are assigned from podrazdeleniye. Drivers are not permitted to sleep in vehicle cabs while in the rest areas.

A motor vehicle column is formed from not less than 20 cargo trucks with their trailers and organizational combat equipment carried on hooks. Ambulances, administrative vehicles, and march closing files are included in the column. If many drivers take part in the march several columns are formed, for each of which the time at which the column should pass the initial point is designated so one column would not over run another.

All vehicles which are involved in the march must be checked and thoroughly prepared for fault-free operation in accordance with road and climatic conditions. The completeness and working order of illumination devices and also means for heightened roadability and self-extraction, towing equipment, and entrenching tools are checked especially carefully. For the purpose of controlling motor vehicles during movement, the column chiefs are given signal flags, traffic signal batons, and markers. The column chief who rides at the head of the column and his deputy for materiel who usually moves with the closing files must have radios. This makes it possible for the column chief to receive information constantly about all vehicles which break down, their condition, the place where they stop, and measures which are taken. It would seem that these are copy-book truths but they must not be forgotten. And this is why. Once during a march a severe snowstorm started. On the vehicles there were no shovels, tow cables, or tire chains and without them forward movement was extremely difficult. The march was delayed for 12 hours and it was necessary to shorten the route. Several of the teaching points remained uncovered.

Only a well-organized march makes it possible to carry out training tasks successfully and results in benefit to young soldiers.

It is impermissible to allow any over-simplification or to lower the demands made on personnel.

At the same time there are frequent instances of harmful oversimplification and lowering of demands. Thus, in one podrazdeleniye the march was conducted in a closed circle which permitted return to the chast' area each time. The vehicles were serviced in the motor pool and personnel rested in barracks. Light camouflage measures were not observed during movement and drivers did not drive their vehicles while wearing individual chemical defense clothing. Indeed, the goal of the march was just exactly to give practice in driving under conditions which approached actual combat as closely as possible. Understandably the senior commander ordered that the march be repeated and in strict accordance with present-day demands.

Commanders and their deputies must assume complete responsibility for training their military drivers during the new training year inasmuch as on fulfilling this responsibility depends not only accident-free vehicle operation but also a high level of combat readiness of all motor vehicle and tractor equipment.

THE TECHNICAL KNOWLEDGE OF AN OFFICER

(SUMMING UP THE RESULTS OF A DISCUSSION)

Representatives of all services of the Armed Forces and branches of the service without exception took part in discussing the article "The Technical Knowledge of an Officer." * / * Tekhnika i Vooruzheniye, 1966, Nos. 1, 4, 5, 6, 7, 8, 9, 10. / The responses received by the editors show that the questions raised in the article interested many commanders and specialists. Their pressing nature is unquestioned.

The question of the content of a troop unit officer's technical knowledge occupied a central position in the discussion. Many officers reflected their concern over just what a commander or specialist in the Army or Navy should know and how thoroughly he should study. The total amount of military-technical information available to us in our century is tremendous. And inasmuch as "it is impossible to encompass the unencompassable" all participants in the discussion logically come to the conclusion that it is necessary to specialize.

Captain K. Balats, Captain 2nd Rank V. Yermolenko, Engineer-Major L. Keptsy, and other officers discussed a differentiated approach to specialization in training. Their ideas are extremely convincing inasmuch as they are based on objective conditions obtaining in troop units and on ships today. Captain 1st Rank N. Gorshkov and Engineer-Captain 3rd Rank Ye. Scherbakov also touched upon this same question one way or another. They with some foundation suggested that the amount of training a watch officer on a ship should have and its course of development should be defined exactly.

Engineer-Captain-Lieutenant I. Shubin put very clearly a thought expressed by many. He wrote: "Specialization is what mankind has arrived at as a result of scientific and technological progress. Without specialization it is impossible to create improved combat equipment and learn how to use it correctly and successfully. It is no coincidence that special training lies at the basis of engineer cadre training not only in the Navy but in other services of the Armed Forces."

However, excessive specialization in training can only result in harm. It appears that Comrade Shubin became somewhat carried away and failed to avoid this mistake. In evaluating such disciplines as the technology of metals, the theory of mechanisms and machines, the theory and design of ships, and a ship board power plants from the point of view of practical use for an officer who specialized in radio electronics, he considers it possible to reduce them greatly in order to devote more training time to purely special disciplines closely related to radio electronics. If this thought of his were extended it would be possible to exclude several general technical disciplines from the program altogether. He suggests something similar to this in his article.

It is impossible to agree with such ideas since none of us must ever forget the words which were included in the title of Comrade Shubin's article: "An Officer Candidate Is a Future Engineer." And inasmuch as an officer candidate is trained to be an engineer and not a technician or simply a "knowledgeable man," he must acquire the required volume of general technical knowledge. Otherwise he will have no basis to claim the title of engineer and possess an engineer's diploma. It also must not be forgotten that a naval engineer is called upon to serve at sea, that is, he is called upon to be an officer-sailor, and this requires extensive naval training.

Engineer-Major L. Keptsy was right when he showed very clearly that excessive preoccupation with specialization (he had in mind specifically a helicopter podrazdeleniye) is unwise since a specialist who is too narrowly specialized does not have a broad enough outlook for service in a troop unit and he is unable to adopt a correct engineering solution for any of the problems which arise.

To what should preference be given -- breadth of military-technical outlook or depth of special knowledge, that is, breadth of depth? This is the question which Engineer-Captain V. Yaroshenko asks himself and he comes to the correct conclusion. He thinks that all depends on the circumstances and on the specific duties performed by an officer. This is what Lieutenant Colonel M. Pravilov says. He points out a true course for solving the problem. It is necessary to look first of all at the duties performed. They determine everything.

Let us take, for example, a small ship with a diesel or diesel-gas turbine power plant. The fact that there is only one engineer-mechanic on a ship is sufficient to determine rather clearly his functions and the extent of the knowledge he needs.

Military rules and regulations require every podrazdeleniye commander not only to know in detail the design and rules governing the operation of equipment entrusted to him but to be able to maintain it himself and use it in combat. This serves to define adequately the amount of technical knowledge and personal skills which an officer must have. After examining all the functions performed by a particular officer, including his duties as a deputy commander, it is possible to determine the amount of military-technical knowledge he needs - as it is expressed in scientific literature - "completely unambiguously." This volume of knowledge must lie at the basis of all instruction and training planned for a year. The officer must broaden his general technical outlook during on-duty hours. And the broader this outlook is the better things will go for him.

In their letters readers expressed opinions not only about what to study but also how to study. They discussed for the most part the organization and methods used in the technical training of officers of various specialties. Officers-specialists in Army and air chast' and on ships in the Navy discussed the methods which they had developed in training and they shared their experience in organizing technical training. They discussed the difficulties and problems they encountered along the way and pointed out the achievements of the best experts in methods of instruction. Unquestionably by this approach they contributed to wider dissemination of foremost experiences.

The course of the discussion showed the correctness of the opinion expressed by Major General G. Mikhaylovskiy to the effect that the very same pieces of equipment in different branches of the service are studied using different methods, the degree of effectiveness of which is not the same. Introducing and disseminating widely the most time-saving and effective methods in all chast' and on all ships is a most important task confronting military pedagogy and troop unit practice. The preparation and dissemination of scientifically based texts on methods of instruction and manuals on the subject of technical training, as is clear from many of the letters received, must become the prime preoccupation of troop unit and shipboard specialists and officers on staffs, in administrations, and in military educational institutions. Concern for raising the effectiveness of training permeated literally all the letters received.

We hope that the exchange of opinions and foremost experiences which took place on the pages of our magazine will help in some measure to promote unity of views concerning technical training and mutual enrichment of the methods used by airmen, sailors, and tankers. In any event, benefit based on the experience acquired by officers in planning, organizing, conducting instruction and training in outstanding podrazdeleniye can be derived from many of the letters. The articles written by Engineer-Colonel N. Panov, Engineer-Lieutenant Colonel V. Osipov, and Captain S. Stolyarov and other officers confirm this statement convincingly. In them concrete experience is set forth which, as N. Panov justly points out, should be valued highly.

However, among the recommendations expressed by authors in different articles there were some which should be regarded critically. We have already spoken of the article written by Comrade Shubin. Along with much else he criticized examinations as a method for checking knowledge which, in his opinion, was little effective (even in an educational institution) and he argued for a system of tests. Incidentally, Engineer-Major N. Rudenko pointed out the effectiveness of tests and many other methods for enlivening the work of students. But should examinations be rejected altogether? It has long been recognized that checking knowledge by giving examinations has a selective nature and the element of change plays an important role. But examinations have their advantages. Usually it marks an important stage in the training system and brings to a point long study of some discipline or other, mobilizes students, and obliges them to hold a large complex of difficult questions in their heads at one time. At an examination an officer candidate or an officer demonstrates not only his knowledge of the subject but his ability to present one particular section of a program in a sound methodological fashion, strengthening his words with mathematical computations and diagrams and using visual aids. Whether a future teacher is able to apply in an operational manner the knowledge he has accumulated and to think independently, convince others, and demonstrate his mastery of speech and technical terminology and what ability he has in preparing graphics is something of great interest. An examination reveals these capabilities in a future officer better than, say, a question period during the course of instruction or a test on some particular section. We do not intend to belittle the importance of other methods of checking knowledge. Oral tests and test machines for checking level of knowledge are effective methods which are worthy of wide application. It is important that a technical training instructor know well the possibilities to be found in all methods of training and use those which are most effective in a particular situation, not restricting himself to a few favorite methods and procedures. In this he will display his pedagogical skill. Not rejecting anything and not reducing the arsenal of pedagogical weapons but improving it and enriching it with new methods and procedures -- this is the task which we must carry out today.

The discussion of the article written by Major General G. Mikhailovskiy is over. However, in publishing this concluding article we do not intend to put to rest such a complex, important, and pressing problem as the technical training of officers under present-day conditions. It is hardly possible to hold the opinion that this question will ever be settled once and for all. Equipment constantly increases and improves. Therefore the methods used to study it and organization of these methods cannot stand in place.

This magazine will continue to discuss suggestions directed toward improving technical training, publicizing new technical means used in training and drawing general conclusions from outstanding experiences acquired in mastering combat equipment.

TRAINING IN ECONOMICS FOR ENGINEERS

By Major General A. Gorchakov

Strengthening the defensive might of our country depends largely on how well the means allocated for this purpose are used. For this reason the high demands which are made of training in economics for our military cadres, especially engineer specialists, can easily be understood.

V. I. Lenin wrote: "The problem of defense of the Soviet Republic insistently demands the greatest possible economy of forces and the most productive possible use of the people's labor."* / * V. I. Lenin. Collected Works, Vol. 37, p. 367. / It follows that a military engineer must constantly inculcate in his subordinates a correct sense of responsibility for the many very valuable things which the people have entrusted to them.

A military engineer carries out the technical policies of the Communist Party and the Soviet government, creates combat equipment, and organizes wise use of it. He is obliged to know objective economic laws well and, guided by them, search for the most effective ways to produce equipment and operate it. He often encounters such concepts as prime cost, profit and loss accounting, and profitability. The success a military engineer enjoys in his activity depends in no small measure on the level of his military-economic education. This is why it is so necessary for him to have broad knowledge and practical skill in this field.

Therefore, while still within the walls of an educational institution the future engineer should learn a correct government approach to planning and using equipment, learn how to think in economic terms, and make capable use of various prescribed standards.

Suggestions have already been published in the press about introducing a course of lectures about military economics in military academies. The Military Red Banner Signal Academy supports these suggestions. The council of the academy decided not to wait until a program could be developed and introduced for this discipline but to adopt many practical recommendations for organizing the teaching process in the academy.

For example, it was recommended to the Department of Political Economy that it study the subject "Characteristics of the Main Categories in the Economics of Communication" and prepare recommendations for a plan and course program for "Economics of Military Communication." In the principal courses of the departments there will be reflected subjects devoted to the economics of planning, producing, and operating means of signal communication and also to the military-economic basis for scientific-research work and course and diploma projects. It was recommended to the departments directing probationary work of students that they include in programs for production and repair practice matters dealing with the economics of military communication.

The first step has already been taken in preparing a course entitled: "Economics of Military Communication." In order to give members of the professorial-instructor staff needed knowledge in this field the Department of Political Economy prepared a scientific report on the subject: "Concerning the Main Categories in the Economics of Military Communication." It also prepared a lecture devoted to ways to study these categories.

In the academy a great deal of work is being done to give comprehensive economic foundation to diploma projects so as not to allow a simplified approach which generally amounts only to performing typical cost calculations for parts and materials. The departments are preparing

methodological texts which will help students give foundation to their diploma projects in military and economic respects. Useful advice is contained in them about how to justify the combat and economic effectiveness of the means of communication which are being developed and modernized and how the most important calculations must be performed. In preparing these texts related departments and other educational institutions have been used.

A conference for the professorial-instructor staff was conducted. At it the methods used to give an military-economic foundation to diploma projects and their application were discussed. Lecturer Ye. Spirov gave a report on a diploma project in which possible variations for modernizing a radio relay line were considered. The decision was adopted to approve this project.

It was noted at the conference that in giving a foundation for systems and means for controlling communication it is very important to find solutions which make it possible for the planner to meet specific operational-technical demands at the least possible cost.

The conference drew up recommendations which are already finding wide application in diploma work this year. The materials and practical recommendations of the conference are generalized in the text Military-Economic Basis in Diploma Planning. The book shows how, in planning new means of signal communication and modernizing existing means and methods for combat application of them at various levels of control, students must devote closest attention to the selection of military-economic indicators and to improvement in the methods used to make calculations.

At the conference the importance of further efforts in all departments in preparing texts for students is also discussed. The military-scientific group of the academy is already drawing up theoretical propositions for the economic foundation of systems and means of military communication.

The work begun in the academy, in our opinion will make it possible in the last analysis to solve successfully the problem of raising the level of knowledge of economics among future military engineers. In teaching students to evaluate their projects comprehensively, we base ourselves on the idea that this work has great educational importance. It develops in them a careful attitude toward using the means allocated to strengthening the defense of our country and inspires students to find ways to produce the best solutions to specific technical problems at the least possible cost.

And so, life requires that the members of engineer cadres in our Armed Forces have thorough military-economic knowledge. For this reason, in our opinion, it is also necessary to improve courses in political economy, being strictly guided by the basic decisions of the 23rd Congress of the CPSU.

In beginning to teach military-economics in academies it is very important in studying special-technical disciplines and while gaining practice in actual production and on military probation to give thought to questions of economics as applicable to the specialty of the particular academy.

All this together will play an important role in training a military engineer who is able to cope with present-day demands.

EXAMINATIONS FOR RATINGS

By Engineer-Major N. Korozov and
Engineer-Major A. Kolomiyets

The engineer-technical directors in our chast' are concerned with planning training for rated specialists. This planning begins with drawing up future plans for the new training year in podrazdeleniye. After a discussion in which representatives of the Party and Komsomol organizations take part the plans are delivered to the chast' staff where they receive final correction and are discussed by the technical council. Then the future plan for training rated specialists is drawn up. The actual capabilities of podrazdeleniye; the level of theoretical training, practical skill, and troop discipline; and also the socialist obligations they have assumed are all taken into account. For example, in one of our future plans for training rated specialists-technicians, provision was made for training three master craftsmen 32, specialists first class, 39, specialists second class, and 16.5, specialists third class.

In the beginning of a new training year we draw up a list of theoretical subjects and practical work applicable to the aviation equipment in use in addition to the general requirements for each specialty. We acquaint specialists with these lists and then include them in working notebooks, indicating the time at which tests will be given.

The chiefs of technical operations chast' (TECh) groups draw up cards (the form of test cards used in our chast' is shown below) for each specialist who is raising or confirming his rating. In these cards they record the numbers of theoretical subjects and practical work items in which examinations must be passed.

It should be pointed out that the results achieved in passing examinations can best be recorded in report books. In our opinion, the time has come to prepare these books in standardized form and issue them to chast' centrally. We take up the most difficult subjects at lectures, seminars, and classroom-group instruction and the easier questions during the hours of self-preparation which are designated by the commander in accordance with the combat training plan.

Knowledge of theoretical questions and performance of practical work are checked preliminarily by a specialist's immediate superior and knowledge of certain questions by chast' engineers. In checking technical inspections, finishing work, or repair the checker gives each soldier a specific task and after it has been completed he assigns a grade. If the grade is lower than "good" the specialist receives further training at demonstration exercises.

One who is taking his examination for the rating of first class or master craftsman must be given such tasks as maintaining aviation equipment away from a base and receiving aviation equipment from various chast'.

Those soldiers who have completed the entire program of practical work who have passed a preliminary test in theory, who are not guilty of violating military discipline, or who have not been reprimanded for poor maintenance of equipment over a period of a year take their examinations for ratings during the fall session and all others during the period when aviation equipment is being prepared for spring-summer operation. If a specialist fails to confirm his knowledge during these sessions his rating is reduced.

We include engineers of all specialties and representatives of the next higher staff in the examination commission. The examinations are given by using tickets on which there are four or five theoretical questions and one or two questions involving performance of practical work. Of course it is impossible to rate the knowledge of a specialist based only on the answers to questions found on a particular ticket. Therefore, when giving a final rating the commission takes into consideration the grades which have been entered in record cards.

As the experience of many years shows, this method for organizing examinations gives positive results. Here are several examples.

Junior Sergeant on Extended Duty N. Stepin serves in the chast'. In performing the duties of a senior mechanic for instrumentation he showed himself to be an inquisitive and well-trained specialist. He helped carry out special tasks many times as a member of a helicopter crew. Thanks to his good theoretical training, the practical skill he had acquired, and his knowledge and resourcefulness, Stepin helped the crew many times in preparing an MI-6 helicopter for flight.

Once the helicopter was being prepared for immediate flight. One of the engines refused to start because a start panel had failed. Help could not be sought anywhere since the helicopter was located at a temporary airfield. Junior Sergeant Stepin found that a relay in the start panel was not functioning. But where could a relay in working order be found? The weather was very hot and there would be no need to use the de-icing system in flight. And so a relay in this system similar to the one in the start panel was used. The specialist reached the only correct and wise solution and with the agreement of the crew commander replaced one relay with the other. The engine started and the crew carried out its assigned mission. Last year Junior Sergeant N. Stepin was awarded the rating of master craftsman.

Guards Master Sergeant on Extended Duty M. Sharov, a participant in the Great Patriotic War, traveled a difficult combat path. Red Fleet sailor, tanker, driver first class, senior mechanic for electrical equipment -- such is an incomplete list of the professions practiced by Mikhail Ivanovich Sharov and he knows each profession to perfection. Sharov capably transmits to his subordinates his very rich experience in operating complex aviation equipment. He carries out the duties of senior mechanic for electrical equipment and at the same time he is a squad commander. M. Sharov became a master craftsman last year.

In the chast' 38, of the specialists have high ratings. Among them are Captain of Technical Service P. Pointsev, Senior Sergeant on Extended Duty A. Shavrin, Senior Technical Lieutenant A. Korobeynikov, and many others.

Organizing the preparation and conduct of examinations for the title of rated specialist demands thoughtful and painstaking labor from all commanders and chiefs. However, some problems are solved incorrectly. One shortcoming, in our opinion, is the fact that the list of theoretical subjects and practical exercises is drawn up in a chast'. The requirements for training technical personnel are set forth only in general terms in pertinent documents. Therefore, subjectiveness cannot be avoided in determining a specialist's level of training.

For example, if one were to take several specialists having one and the same rating and occupational specialty from different chast', as practice shows the level of training will not be the same. It is altogether obvious that this is a reflection of the different requirements which are made of rated specialists. We think that the requirements contained in orders of the Minister of Defense concerning the training of rated specialists must be expressed in concrete terms for every type of aviation equipment.

All of this is evidence of the fact that the system for training and employing rated specialists requires further improvement and development since in the system there lie great possibilities for improving the combat readiness of our Armed Forces.

Карточка подготовки на 1-й класс													
Механика по электрооборудованию													
(воинское звание)													
(фамилия, имя, отчество, подразделение, а/часть)													
Теоретические работы													
№№ теорет. тем	1	2	3	4	5	6	и т. д.	до	43	44	45		
Оценка													
Дата проверки													
Ф. и. о. проверяющего													
Роспись проверяющего													
Практические работы													
№№ практ. тем	1	2	3	4	5	6	и т. д.	до	37				
Оценка													
Дата проверки													
Ф. и. о. проверяющего													
Роспись проверяющего													
Заключение командира подразделения													
Командир подразделения													
(подпись)													
196 г.													

Preparation Card for Rating of 1st Class

Electrical equipment mechanic _____
(military rank)

(last name, first name, middle name, подразделение, chast')

Theoretical Work:

No. of theoretical subject

1 2 3 4 5 6 etc. to 43 44 45

Grade

Date of check

Name (last, first, and middle) of checker

Signature of checker

Practical work

No. of practical subject

1 2 3 4 5 6 etc. to 37

Grade

Date of check

Name (last, first, and middle) of checker

Signature of checker

Conclusion of подразделение commander

Подразделение commander

196__.

(signature)



Master craftsman for instruments Junior Sergeant on Extended Duty N. Stepin performs a preflight inspection on a helicopter.

GRAPHIC NOT REPRODUCIBLE



Senior Sergeant on Extended Duty A. Shavrin enjoys deserved respect among airmen. The equipment which he maintains always works without failure. In the photo A. Shavrin checks an electric drive mechanism on a helicopter.

GRAPHIC NOT REPRODUCIBLE

PICKUP UNIT TO RECORD CROSSING OF CEASEFIRE LINE BY TANK

By Colonel N. Tanin

Up until recently crossing of a cease fire line by a tank on a tank range was recorded, for example, by cable-operated pickups which functioned due to tension imparted to a cable. These pickups were simple in design but not reliable in operation. The cable often broke under the tank tracks or was pressed into the ground.

Pickup units which functioned when a radio antenna on a tank touched a cable also proved to be insufficiently effective.

At the present time a radiotechnical pickup is being introduced in troop units which operates in the millimeter radio band. It functions reliably under any weather conditions (with a range of air temperature from -40 to $+50^{\circ}\text{C}$) and when the power current fluctuates from -20 to $+15\%$ of the rated value.

At the instant the tanks cross the cease fire line a radio beam sent from the transmitter to the receiver is interrupted as a result of which the stopwatches located on the control panel for the particular range sector stop.

The radiotechnical pickup, the so-called line-crossing pickup unit (FPR), consists of a transmitter and receiver (see the last page of the cover) located in shelters (on pedestals) 30--50 m from one another on the borders of the trail. The range control panel is used to switch the transmitter and receiver on and off by remote control.

The transmitter (Figure 1) is intended for the purpose of generating electromagnetic oscillations of high-frequency energy. The operating regime is a pulse regime. The wave length is 8 mm. The recurrence rate is 50 pulses per second. The strength of emission is about 11 mV. The power required is 65 W. The range of operation is about 100 m.

The transmitter includes a klystron generator, a waveguide antenna system, and, a ferro-resonance voltage stabilizer.

The klystron generator (a K-49 reflecting klystron) works in a pulse regime. A distinguishing feature of the K-9 operation in the FPR transmitter is that alternating current is delivered to its electrodes. During the positive half-period of voltage applied to the resonator the klystron generates 4--6 pulses. The average power released by the resonator is about half that of a continuous regime and as a result a normal temperature regime for klystron operation is brought about (there is no need for forced air cooling).

RECEIVED FOR CHIEF

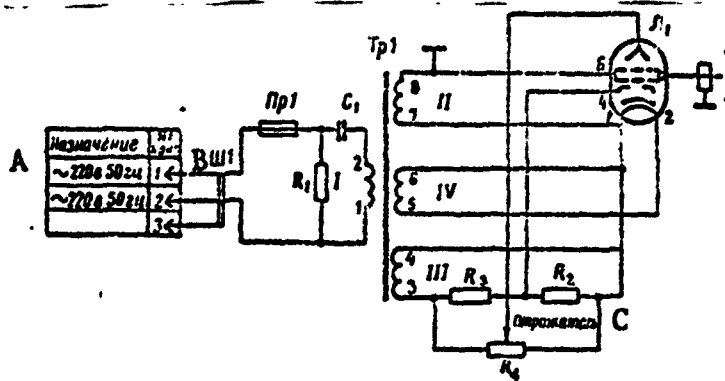


Figure 1. Diagram of transmitter.

Legend:

A Purpose

B Number of circuit

C Reflector

The antenna-waveguard system serves to transmit the high-frequency energy generated by the klystron to the antenna, and emission of it into space. It consists of a parabolic antenna and a waveguard. The antenna is covered by a lid which permits the passage of radio waves. It protects the antenna against the effects of weather. The diameter of the paraboloid is 93 mm, the coefficient of amplification is 800, and the angle of antenna aperture is about 6°.

The ferro-resonance voltage stabilizer delivers the following stabilized alternating current to the klystron: 1700 volts to the klystron resonator, 300 volts to the power circuit of the reflector and the circuit of the klystron accelerating electrode, and 6.3 volts to the klystron filament.

The positive voltage half-period with an amplitude of 1700 volts is used for pulse modulation of the klystron.

The transmitter is mounted in a sealed cast-iron housing measuring 305 X 195 X 195 mm. It weighs 10 kg. The front panel and the antenna are covered by sealed lids. In operating position the antenna lid is opened and fastened to the side wall.

The receiver (Figure 2) is intended for the purpose of receiving and amplifying the amplitude modulation oscillations. The range of reception is about 100 m. The sensitivity is not less than $1 \cdot 10^{-7}$ W. The receiver draws power from an alternating current circuit at a voltage of 220 V. The power required does not exceed 20 W. The receiver is mounted in a cast-iron housing measuring 305 X 195 X 195 mm. It weighs about 8 kg.

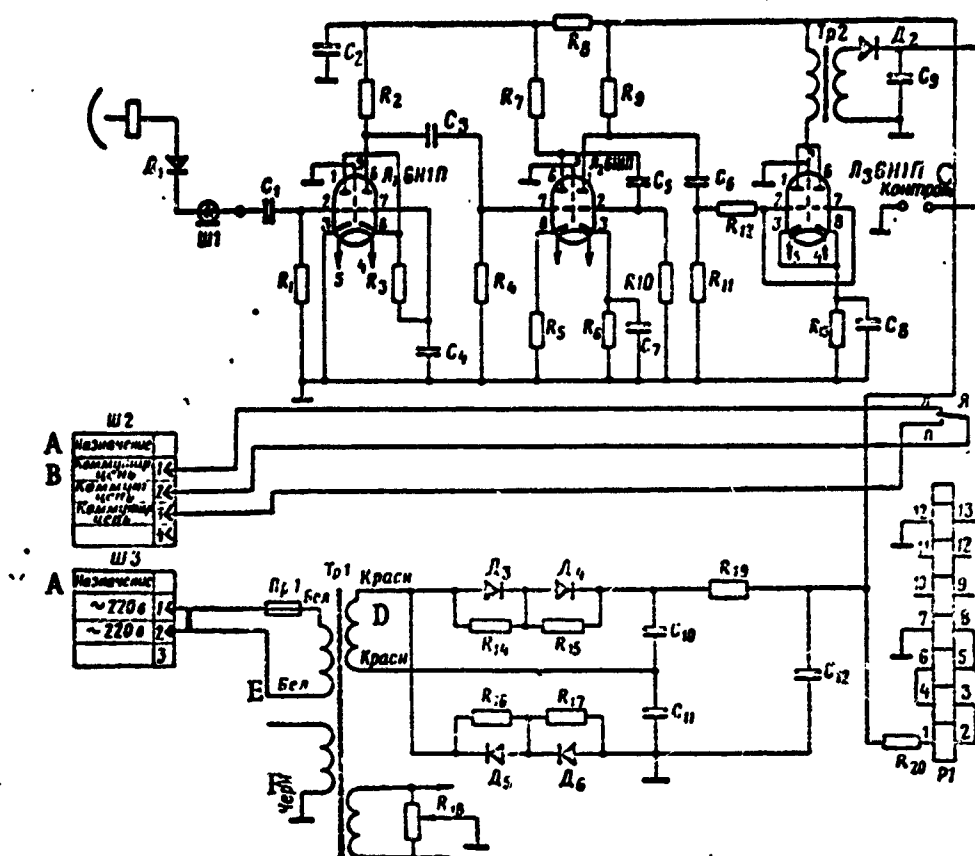


Figure 2. Diagram of receiver.

Legend:

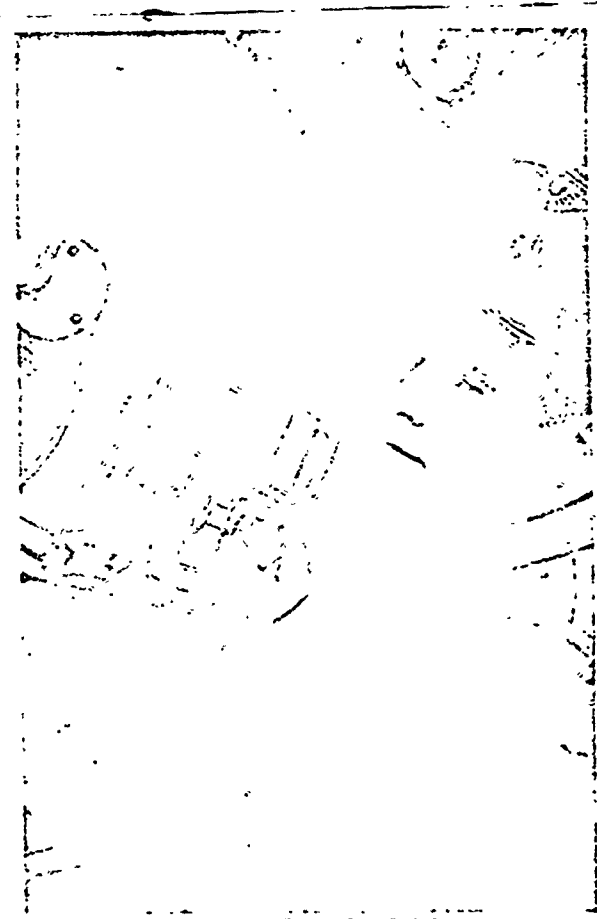
- A Purpose
- B Commutating circuit
- C Monitor
- D Red
- E White
- F Black

The receiver is assembled for straight amplification. At the input is a detector, D_1 , which is matched with the waveguide. Video pulses are separated at the detector output. They go through the separation circuit, $S_1 R_1$, to the first stage control circuit of the pulse amplifier which uses Tube L_1 . The electronic relay uses Tube L_2 . It amounts to an amplifier the load of which is a transformer. A half-wave rectifier with a capacitance filter is included in the secondary winding of the transformer. The polarized relay, R_1 , serves as the load for the rectifier and the registering element. The time constant of the rectifier filter is so computed that during the time between two pulses coming from the transmitter the capacitor does not succeed in becoming charged through the relay winding. The voltage on the capacitor grows. It forces Relay R_1 to function and Contacts P--Ya to close.

When the tank crosses the cease fire line the radiowave is broken and the capacitor succeeds in charging itself. The current flowing through the relay winding and the voltage on the capacitor drop. The power circuit of the electromagnet is closed and the stopwatch labeled "Exercise Time" stops, recording the time at which the line is crossed.

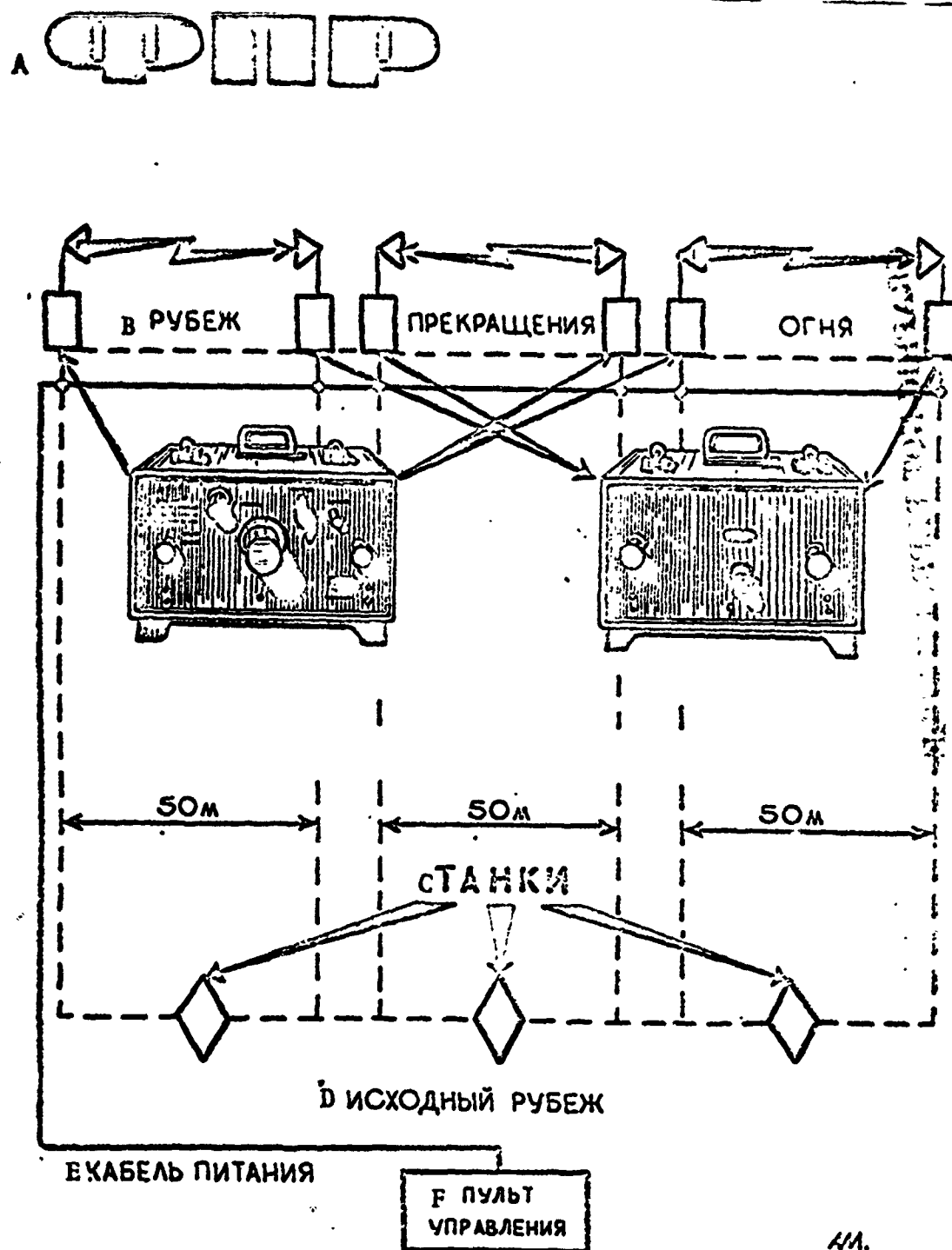
Radiotechnical pickups are installed at the cease fire line. The transmitter and receiver are contained in shelters (brick or reinforced concrete pedestals) 0.8--1.0 m high. In a pedestal there is a rest for the receiver or the transmitter and a window which is covered by plastic foam or polystyrene. The transmitter and receiver are located 30 cm under the ground, otherwise unevenness in the ground might cause interference.

After the transmitters and receivers have been installed in the pedestals, they are oriented in pairs. Their orientation is checked by a voltmeter in the magnetic-electrical system with a measurement limit of not less than 30 V and an input resistance of not less than 1 kilohm/V. The voltmeter is connected to the "Monitor" socket on the front panel of the receiver. The maximum readings of the voltmeter (more than 15 V) connected to these sockets is evidence of the fact that the signal is completely adequate for normal operation of the relay. There are no controls for tuning the receiver and this makes operation of it as simple as possible. It should be kept in mind that a mismatch angle between the axis of the antenna, α , of 3° cuts the power received by the receiver by approximately half. After orientation the pedestals are covered. They are uncovered once every two or three months for a preventive inspection.



GRAPHIC NOT REPRODUCIBLE

In the group headed by Captain of Technical Service V. Golubev all airmen are experienced specialists. The apparatuses which they prepare for flight work without failure. They have accomplished this thanks to precise organization of their work. In the photo Specialist 1st Class Captain of Technical Service V. Golubev inspects an apparatus on motor pool day. (Photo by Ye. Sinakov.)



7/09/71

Legend:

- | | | |
|-------------------|----------------|-----------------|
| A FPR | C Tanks | E Power Cable |
| B Cease Fire Line | D Initial Line | F Control Panel |

Operation, care, and repairPROTECTION AGAINST CORROSION

By Engineer-Captain 3rd Rank S. Benatov,
Lecturer, Candidate of Chemical Sciences

Not only metal is destroyed by corrosion. Sometimes items which may cost thousands of times more than the metal itself are rendered useless. The indirect losses are huge.

There are two main ways which are used to develop and study methods and means for combatting these phenomena. The first is creating resistant materials and the second is protecting metals against corrosion.

In this article we will discuss methods and means to protect military equipment and weapons against corrosion while they are in storage.

Among the various protective coatings which may be applied a special place is occupied by lubricants and oils (greases and liquid inhibitors). It is not difficult to apply or remove them from items, the protective coating can easily be renewed, and they are convenient to transport and store. No extensive preparation of the surface is required for them and the protective coating protects metal against corrosion without renewal for a period of 5--6 years (excluding those areas having a tropical climate).

The most promising is high-quality gun grease (FVK) - (Table 1). In it is a 1% MNI-7 additive (oxidized ceresin). Usually hydrocarbon lubricants drip from vertical metal surfaces at a temperature of 35°C. Inhibiting FVK with an MNI-7 additive begins to flow off at a temperature of 45--55°C but a thin layer possessing protective properties will still remain on the item.

FVK has been widely used for more than five years under conditions existing at sea. It has been found that the period items treated with it can be stored is two or three times greater than when gun lubricant or technical vaseline are used. Greases are difficult to apply to a surface and furthermore items which have been preserved with them need repeated treatment.

(see Page 78 for Table 1)

Table 1

Таблица 1

Наименование смазки	ГОСТ	Температура каплепадения, °C, ГОСТ 6783-53	Температура сползания, °C, ГОСТ 6037-51	Кислотное число, мг KOH, ГОСТ 6707-57	Температура затвердевания, °C	Примечание
Технический вазелин	783-59	54	30	0,28	-10	Для защиты изделий из цветных металлов
Пушечная смазка (смазка УНЗ)	3005-51	50	30	Не более 0,3	-10 (не растворяется при -40)	Для защиты изделий из черных металлов в условиях средних и северных районов СССР
ПВК (пушечная высшего качества)	10586-63	52	48	0,8	То же	Для наружной консервации изделий из черных и цветных металлов
ПП-85/5 (предохранительная)	4113-48	55	46	Не более 0,28	Не растворяется при -50	Для длительной наружной консервации (не рекомендуется для точных механизмов и приборов)
ГОИ-34 (смазка УПВМ)	3276-63	64	39	0,06	Обеспечивает работу механизмов при -35	Применяется в трущихся парах механизмов и приборов
ГОИ-54П	3276-63	65	50	0,76	То же	Равноценна пушечной смазке.
СХК	ВТУ 38-13-677-61	60	48	0,33	-10	Для наружной консервации сельскохозяйственной техники
АМС (АМС-1, АМС-3)	2712-52	85-95	—	—	—	Предохраняет от коррозии металлические поверхности, соприкасающиеся с морской водой. Используется как рабочая смазка в некоторых узлах судовых механизмов для герметизации резьбовых соединений
ЗЗК-3 (защитная клейкая смазка)	ТУ 376-57	70	—	—	—	Для длительной консервации транспортных машин (главным образом герметизация отверстий для предотвращения попадания влаги)
Смазка амуниционная	2649-52	45	—	—	—	Предохранение от коррозии металлических частей амуниции (смазывание кожаных деталей)
Смазка АС-70	9762-63	80	—	—	—	Покрытие металлических поверхностей приборов и механизмов, соприкасающихся с морской водой

TABLE 1

Name of Lubricant	GOST	Drop Point Temperature in °C, GOST 6793-53	Flow-off temperature in °C, GOST 6037-51	Acid Number in mg KOH, GOST 6707-57	Solidification Point in °C	Remarks
Technical vaseline	782 - 59	54	30	0.28	10 - 10	For protecting items made from non-ferrous metals
Gun grease (GILZ lubricant)	3005 - 51	50	30	Not more than 0.3	(does not crack at -40°)	For protecting items made from ferrous metals under conditions obtaining in middle and northern regions of the USSR
FVK (high-quality gun grease)	10536-63	52	48	0.8	-10 (does not crack at -40°)	For preserving outer surfaces of items made from ferrous and non-ferrous metals
PP-95/s (preservative)	4113-48	55	46	Not more than 0.28	Does not crack at -50	For extended preservation of outer surfaces (not recommended for precision mechanisms and instruments)
GOI-54 (lubricant, UNVK)	3276-63	64	39	0.06	Ensures mechanism operation at -50	Used where parts in mechanisms and instruments rub together
GOI-54P	3276-63	65	50	0.76	Ensures mechanism operation at -50	Equivalent to gun grease
SKhK	VTU 36-13-677-61	60	48	0.33	-10	For preserving outside surfaces of agricultural equipment
AMS (AMS-1, AMS-3)	2712-52	85-95	-	-	-	Protects metal which comes in contact with sea water from corrosion. Used as working lubricant in some units of ship mechanisms for sealing threaded connections.
Z2K-3 (protective glue lubricant)	TU-376-57	70	-	-	-	For extended preservation of tracks (mainly for sealing openings to prevent entry by moisture)

(see page 79)

Table 1 (continued)

Name of Lubricant	GOST	Drop Point Temperature in °C, GOST 6793-53	Flow-off temperature in °C, GOST 6037-51	Acid Number in mg KOH, GOST 6707-57	Solidification Point in °C	Remarks
Ignition Lubricant	2649-52	45	-	-	-	For protecting metal parts of munitions against corrosion (for softening parts made from leather)
Lubricant MS-70	9762-63	80	-	-	-	For covering metal surfaces of instruments and mechanisms which come in contact with sea water

In liquid inhibiting protective lubricants (Table 2) there are by way of bases mineral oils which have in them surface-active substances which act as oil-soluble corrosion inhibitors. They enhance the protective properties of the oil films of ordinary mineral oils. Included in them are adhesive or hydrophobic additives which improve the composition of the absorptive protective film on the metal surface.

Table 2

Таблица 2

Наименование смазки	ГОСТ (ТУ)	Вязкость при 100° С, сСт	Зольность, %	Щелочность по фенолфталеину, мг КОН	Температура застывания, °С
1	2	3	4	5	6
Смазка ручейная жидкая РЖ	9811-61	6 (при 50°С)	—	от 0.3 до 0.7	-60
K-15 (ЦИАТИМ-217-15)	9185-59	15-22	Не более 0.5	0.1	-15
K-17	10877-64	15-22	Не более 2.5	Нейтр.	-20
K-19	10877-64	15-22	Не более 2.5	Нейтр.	-20
НГ-203А	МРТУ 12Н № 78-04	25-30	Не менее 3	Не менее 4	-20
НГ-203Б	"	10-15	Не менее 2	Не менее 2	-20
НГ-203В	"	25-33 (при 50°С)	Не менее 2	Не менее 2	-20
НГ-204	МРТУ 12Н № 69-63	80-160	—	Не менее 1.0	-20
НГ-204У	"	15-40	—	—	-20

Table 2

Name of Lubricant	GOST (TU)	Viscosity at 100°C, in centistokes	Ash content, in %	Alkalinity determined from phenolphthalein, in mg KOH	Solidification point, °C
1	2	3	4	5	6
RZh liquid gun grease	9811-61	6 (at 50°C)		From 0.3 to 0.7	-60
K-15 (TsIATIM-217-15)	9185-59	15-22	Not more than 0.5	0.1	-15
K-17	10877-64	15-22	Not more than 2.5	Neutral	-20
K-19	10877-64	15-22	Not more than 2.5	Neutral	-20
NG-203A	МРТУ 12Н No. 78-64	25-50	Not less than 3	Not less than 4	-20
NG-203B	"	10-15	Not less than 2	Not less than 2	-20
NG-203V	"	25-33 (at 50°C)	Not less than 2	Not less than 2	-20
NG-204	МРТУ 12Н No. 69-63	80-160	—	Not less than 1.0	-20
NG-204U	"	15-40			

K - 15 was one of the first inhibiting liquid lubricants. It is used for preserving certain engines. Long tests and experience in using it have showed that it does not adequately protect steel and cast-iron items against corrosion. Therefore, K-17 and K-19 lubricants are recommended at the present time. Adding oxidized petrolatum and sodium nitrite has increased their protective effect. However, sodium nitrite settles out and therefore it is recommended that K-19 be shaken prior to use. This property makes the use of K-19 lubricant difficult for internal treatment of engines since some systems may become clogged by the sodium nitrite.

NG-203A lubricant is usually used to protect the outside surfaces of items and NG-203B and NG-203V lubricants are used for inner surfaces.

K-15, K-17, K-19, and NG-203 liquid lubricants can be used only for preserving items which are kept in depots under overhangs or cowlings. NG-204 and NG-204U lubricants are not washed away by rain and therefore they can be used to protect items which are stored in open areas.

The guaranteed periods of storage of items which have been treated with the above-named lubricants is not less than five years as long as the items are kept in cowlings, under overhangs, or in containers.

Inhibiting liquid lubricants are not working oils inasmuch as they have unsatisfactory washing properties and thermal-oxidizing stability. It is natural that the technology of their use in preserving military subassemblies also must differ from the use of motor oils. Extended operation of engines using these lubricants is not permissible. However, no noticeable wear of parts or carbon formation result from operating an engine with preservative oil not longer than 20 minutes. This makes it possible to recommend brief operation of engines and their subassemblies using an inhibiting lubricant in order to flush inner cavities. However, when the time comes to put engines in operation labor-consuming work is needed to take them out of storage.

Lubricants and oils which are used for preserving inside surface of engines and their subassemblies must be general-purpose in nature and have normal operating qualities and high protective properties. After many tests an inhibiting additive for working oils called "Akor" (MRTU 38-1-207-66) was found.* [** Tekhnika i Vooruzheniye, No. 11, 1966.*] Introducing it into working oils does not impair their operational and wear-resistant qualities. The additive has good protective properties and is not in short supply. Ordinary oils to which it is added acquire anti-corrosive properties. AKOR-1 additive reduces the list of preservative materials and also the time needed to take items out of storage.

Using volatile inhibitors for preserving equipment was begun not long ago to protect complex items. This method is extremely effective inasmuch as it simplifies the technology involved and there is no longer any need to process items when taking them out of storage or to give them repeated treatment. Items may be stored under any climatic conditions and, what is most important, special areas are not required for the storage of many types of military equipment.

The essence of the method is as follows. A small amount of a substance which vaporizes easily at ordinary temperatures and passivates metal is introduced into a closed space where an item is stored. This substance quickly saturates the closed space with its vapors which are later adsorbed on the surface of the item and then serve to protect it against corrosion.

The most widespread inhibitor is one called nitrite of dicyclohexylamine (NDA). It can be used effectively to protect the most complex items against corrosion for a period of 5--8 years. One essential condition for protection is a sealed system. NDA protects well items made from all types of steels,

cast iron, aluminum, nickel, and chromium. While so doing it does not change the properties of plastic, rubber, leather, gasket material, or paints and varnishes and it does not interact with strong oxides or fuel although it dissolves completely in them.

Other volatile inhibitors have been introduced such as carbonate of monoethanolamine; phosphate (FIL), benzoate (BIL), and urotropine (UIL) inhibitors; salts of hexamethylenamine; and also organic and non-organic acids (carbonic, O--nitrobenzoic, 3,5--aminobenzoic). Many methods are used to apply them. They can be applied to inner surfaces of items by spraying with an alcohol or other solution or dusting with a powder or by blowing into the inner cavities dry air which has been preliminarily saturated with the volatile inhibitor. Moreover, saturated with the inhibitor can be placed inside packing paper or cardboard materials and also items can be packed in boxes which have been lined with inhibiting paper.

In all cases it should not be forgotten that volatile inhibitors are harmful for human health. In working with them all safety measures must be strictly observed. They must not be allowed to fall on the skin or mucous membranes and inhalation of their vapors must be avoided at all costs.

The inhibitors which have been named can be used successfully primarily to protect items made from ferrous metals. Most nonferrous metals are not protected by them. Therefore, at the present time much attention is being devoted to creating general purpose inhibitors. Introducing them into production will open broad prospects in protecting military equipment against corrosion.

Polymeric sheeting is widely used for packing military equipment and weapons. In relatively small proportions it possesses high mechanical strength, significant moisture resistance, low perviousness to vapors and gas, transparency (making it possible to inspect an item covered with it without breaking the packing seal), and ability to form a strong sealing seam when thermal welding is used.

But not all sheeting possesses these properties in equal measure. Thus, a polyvinyl chloride sheeting is chemically resistant and elastic and can be welded easily when heated. The most widely used domestically produced polyvinyl chloride sheeting is V-118 plasticized dibutylphthalate. Its limit of tensile strength is about 120 kg/cm² and relative elongation is more than 130%. Its shortcomings are the low level of resistance to heat and light and low resistance to freezing (only -20°C). Permeability to vapor and water of polyvinyl chloride sheeting is four or five times greater than that of polyethylene.

The sheeting most widely used in industry is polyethylene.

Despite its low resistance to oil and grease and also its low mechanical strength (120--130 kg/cm² with a relative elongation of 150--500%) in protective properties it surpasses polyvinyl chloride sheeting considerably.

Domestic industry produces a polyamide sheeting using polycaprolactam as a base. It is called Brand PK-4. It has a working thermal resistance of more than 100°C and tensile strength of about 700 kg/cm². It is distinguished by its good resistance to oil and impermeability to gas. However, because of its low level of resistance to moisture and high perviousness to vapor it cannot be used under heightened vapor conditions.

Sheeting made from polystyrene has great mechanical strength and chemical stability but its great brittleness and high perviousness to vapor makes it unsuitable for packing parts.

Sheeting made of lavsan is based on polyethylenoterephthalate. Its tensile strength is 1800 kg/cm², thermal resistance +150°C, and resistance to freezing -70°C. Moreover, this sheeting is distinguished by a low level of perviousness to vapor and gas. Only the poor strength of the welded seam (using ordinary welding methods) prevents wide use of it for packing different items.

Combination sheeting materials containing two and more and rarely three different sheetings are very expensive and are practically never used for packing parts. For this same reason polymeric films with metallic foil are also not used.

Combination packing materials made from paper are also promising. Up to now paper and cardboard have been the most widely used packing materials inasmuch as they have adequate strength and what is most important they are inexpensive. Often paper and cardboard are used with polymeric saturating solutions or coats.

Sheeting made from polyethylene and polyvinyl chloride are finding very great practical application in packing items.

Producing scalable and reliable packaging is a very pressing problem. Such packaging material makes it possible to store items for a long time when suitable protective measures are taken and when the air is properly dried. A sealed container made from glass-plastic where the perviousness of the material to vapor and water has been reduced almost to zero can serve as reliable packaging material. It is possible to use not only plastic but also metal for this purpose. Sometimes a vacuum is created inside packaging material to give greater protection to items and when the space involved is very large it can be filled with nitrogen or argon. During storage the concentration of neutral gas is watched very closely inasmuch as leaks may form along the welded seams or around connections.

Ordinary boxes in which items are packed can be supplied with an additional casing made from polymeric material, for example, viniplast, which is 3 mm thick. It is impervious to vapor and water, has sufficient elasticity and strength in a wide range of temperatures, and due to its high technological properties for welding it provides a complete seal of packaging materials. The cost involved in providing containers with viniplast casings is not great and moreover the material itself is not in short supply. Therefore, it is possible to preserve items without using sealed casings by using polymer sheeting. At the same time the period which items last in storage is doubled or tripled.

* * *

Tekhnika i Vooruzheniye Encyclopedia

Adsorption -- holding or condensing a dissolved or vaporous substance on the surface of a hard body or liquid.

Inhibiting air -- air which is saturated by the vapors of a volatile inhibitor.

Contact inhibitors -- substances the protective action against corrosion of which appear only when they are applied to the surface of the metal.

Volatile inhibitors -- substances which, having high volatility, are capable of being adsorbed on the surface of a metal and protect it against corrosion.

FROM OUR PRACTICE

By Engineer A. Rusina

Metal items (made from steel of all types, cast iron, chromium, nickel, and tin) are preserved by us in sealed packaging material. For this purpose we use a powder which is a nonorganic phosphate inhibitor. We obtain it by careful mixing of sodium nitrite, disubstitution phosphate of ammonium, and calcined soda in a ratio of 7.7:5.6:1 by weight. Parts which are to be preserved are placed on a sheet of parafin paper (cellophane) and sprinkled with this powder. Then they are wrapped in two or three layers of wrapping or parafin paper and packed in boxes. This inhibitor can be used in gauze bags which are distributed evenly among the metal items. In this event we use 1.5 kg of the powder per cubic centimeter of packaging material.

We use a nonorganic phosphate inhibitor in the form of a 15% solution. We use it to saturate paper cardboard packing, and wooden boxes. To obtain 100 kg of such a solution we take 35 m of water heated to 30--40°C and we dissolve in it 0.8 kg of calcined soda, 5.65 kg of disubstitution phosphate of ammonium, and 0.1 kg of sodium nitrite. One liter of this solution costs 0.3 copecks. The paper which is saturated with it protects items against corrosion for three or four years. However, the phosphate inhibitor does not protect items made from copper, zinc, cadmium, magnesium, or alloys based on them.

It protects ferrous metals against corrosion under any climatic conditions for five years or more if a urotropine volatile inhibitor which is made from urotropine and sodium nitrite is used. For saturating cardboard and wooden packaging materials the following solution is prepared: 15 kg of sodium nitrite is dissolved in 70 liters of water and then 15 kg of urotropine added.

In practice we use nitrite of dicyclohexylamine (NDA.) Paper which is saturated with it contains 18--20 g of NDA per 1 m² of steel surface being protected. Ferrous metals are protected by carbonate of monoethanolamine (MEAK). 16 g of it per 1 m² of surface contained in inhibiting paper.

USING A MINE DETECTOR IN WINTER

By Engineer-Major S. Yatsyn and
Engineer-Major P. Nosyrev

Searching for metallic antitank and antivehicle mines in winter with a DIM mine detector has many distinguishing features. When the snow cover is more than 10 cm deep the search system begins to dig into the snow in front of the vehicle, the snow piles up, and the vehicle comes to a stop. This can be avoided if the mine detector system is raised ahead of time and attached in a position such that it does not touch the snow when the vehicle moves over the ground.

The lift device of the mine detector undergoes dynamic strains which sometime break cables when used by inexperienced drivers. It is not difficult to prevent this. We use a simple attachment which amounts to two cables having a diameter of 8 mm and a length of 1850 mm and two auxiliary straps 300 mm long made from cable of the same diameter. Each cable has a hook on one end and on the other a steel ring 80 mm in diameter. Hooks are securely fastened on both ends of the straps. After unfolding the mine detector and setting the detector system at the required level the cables and straps are placed on hooks of the uprights and are fastened to the shaft of the lift device using blocks. When this is done it is not necessary to set the shock absorber frame on the detachable device.

Experience gained in operation shows that it is advisable to use mine detectors in pairs. Vehicles should be staggered one behind the other at an interval of 40--50 m. This arrangement makes it possible to cover a strip sufficient for the operation of snow removal equipment. In sectors which are difficult of access for the mine detector and also in other cases, for example, when preparing turn-offs, reconnaissance is performed by sappers armed with mine detectors and probes. For this purpose an additional team consisting of two men is assigned to each vehicle. The borders of the strip being reconnoitered are marked with ordinary diesel fuel which is poured into a marking device. The mine detector which goes on ahead indicates the strip being covered by it on both sides and the mine detector proceeding behind it only on the right side when facing the direction of movement. The frequency with which liquid is ejected from the marking device is set depending on the expected rate of movement of the mine detectors. The "air" valve is opened by turning it in a counterclockwise direction and then the "liquid" valve is set in the "open" position. After this it is necessary to be sure that the liquid passes through the lead-off pipes.

In the process of searching for mines particular attention must be paid to ice-covered sectors of the road, especially on downgrades. Under such conditions the speed of movement must be minimal. Otherwise, when the automatic stop system functions the vehicle may run into a mine by sliding forward.

In reducing speed inexperienced drivers sometimes make the mistake of reducing the amount of fuel delivered to the engine and driving their vehicles with the engine turning slowly. Drivers should engage the reduction gear since this will provide normal engine operation and the required air pressure will be maintained in the system.

After stopping a mine detector when it is necessary to move a vehicle backward a check must without fail be made to be sure that wheels do not pass beyond the limits of the strip which has been marked. The driver must be sufficiently experienced to know how to use the means at his disposal for increasing the roadability of his vehicle. Sand should be sprinkled under the wheels on icy areas. This increases the grip on the road. The

sand is carried in two boxes which are located in the body of the vehicle. It is also useful to have wooden boards to place under the wheels.

Experience gained in operating the DDM mine detector shows that when preparing the removable device the mine detector system sometimes strikes the ground. Of course such carelessness must not be permitted. During operation it is also necessary to see that the detents of the ratchet gearing are lowered without fail otherwise the removable device may drop when it is lifted. Sometimes the openings in the lift mechanism shaft become covered with ice. Therefore, prior to inserting the handles of the lifting device in their sockets they must be inspected and in case of need the ice removed.

The amount of daily care needed for a mine detector in winter is somewhat greater. During this time of year the parts of the removable and lifting devices are checked thoroughly as well as the automatic stop, signal systems, the power unit, and the marking devices. When inspecting the vehicle it is necessary to be sure water does not get on the brake shoes. If it is anticipated that the mine detector will be stopped for a long period of time the liquid must be poured out of the marker device and the lead-off pipes.

Visiting our friendsMODEL OF AN OPTIMIZING SYSTEM

By Engineer-Major K. Belya, Doctor of Technical Sciences; Engineer-Senior Lieutenant I. Gitsa; and Engineer-Senior Lieutenant K. Dzheordzhesku

At the present time self-tuning automatic control systems are finding increasingly wider application in equipment. One example is optimizing systems which are discussed below.

It is known that the maximum amount of information from a radiotechnical device is obtained when its oscillating resonance circuit is tuned completely to the carrier frequency. The curve of such a circuit is shown in Figure 1. The deviation of resonance frequency, x_m , from the carrier frequency to either side, x_{01} or x_{02} , causes a drop in the amount of information obtained. Such a deviation is the result of a change in the carrier frequency, x_0 , or the resonance frequency, x_m . Complete and constant tuning of the resonance circuit under such conditions can be done only with a self-tuning system. In this case it will be a system of optimizing control.

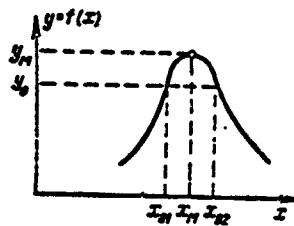


Figure 1. Curve of resonance circuit.

The problem of optimizing control cannot be solved with an ordinary system of automatic adjustments since for this it is insufficient to know only the deviation in value y from optimal values of y_m . Indeed two values of an argument -- x_{01} and x_{02} -- correspond to each deviation of y_m -- y_0 . To obtain an optimizing value it is necessary in one case to increase the value of x and in the other to decrease it. It is impossible to determine the necessary actions in each stage in a control system by the deviation. For this purpose test actions are needed and the direction to the optimizing value can be determined from them. It follows that a control system and any self-tuning control system generally is characterized by two actions: searching for an optimizing value and tuning. Tuning is done using a closed cycle and therefore self-tuning systems are closed. Search can be done continuously or intermittently and together with tuning or apart from it.

Continuous joint search, for example, is done in systems with forced oscillations. An optimizing control system with forced or parametric oscillations usually has a generator which produces oscillations of constant frequency and amplitude and inputs them into the computing and summarizing devices. A computing device can consist, for example, of a filter and a phase discriminator which processes the control signal. This signal is delivered to the amplifying element and then it drives the actuating element.

We designed and built a model for an optimizing control system using resonance frequency of a sequential circuit consisting of two units. In

the first there is a two-phase asynchronous motor of the 2ASM-200 type, a gear box with a transfer ratio of 1:100, an alternating logarithmic capacitor, and a transformer for driving the excitation winding of the motor and the signal modulator. In the second unit there are found the electronic part of the model (Figure 2), a search oscillation generator, a reactance tube, filter, alternating current amplifier, phase discriminator, amplifier-modulator, and a transformer.

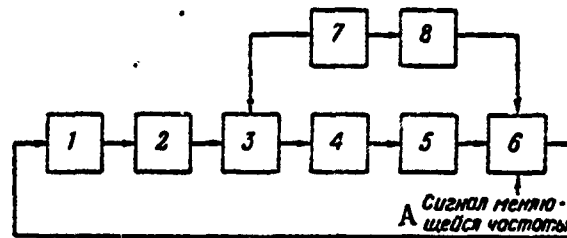


Figure 2. Block diagram of an optimizing system:

- 1 -- filter; 2 -- alternating current amplifier;
- 3 -- phase discriminator; 4 -- amplifier and modulator;
- 5 -- asynchronous motor and gear box;
- 6 -- oscillating circuit; 7 -- search oscillation generator; 8 -- reactance tube.

Legend: A Changing frequency signal.

The distinguishing feature of this system is that the search oscillations are not mechanical but electronic. The alternating capacitance of the system is connected (in parallel) with the main capacitance which is changed by the motor. This provides good filtration and high precision in operation.

We use a model of this optimizing system for presenting lectures and in scientific work for studying the effect of system parameters on the quality of control processes and also for checking experimentally calculations performed by various methods.

Bring science to productionORGANIZATIONAL EQUIPMENT -- PRESENT AND FUTURE

By Colonel A. Koptev

The "Interorgtekhnik-66" International Exposition took place in Moscow in September of this year. About 1,000 firms and organizations from 18 different countries took part. These countries included; Austria, Belgium, Bulgaria, Great Britain, Hungary, the German Democratic Republic, Denmark, Italy, the Netherlands, Poland, USSR, USA, Finland, France, the Federal Republic of Germany, Sweden, Czechoslovakia, and Japan. In the 20 pavilions which covered an area of more than 60,000 square meters there were on display separate items and complexes of apparatuses and instruments which make it possible to mechanize engineer-technical and administrative-management work and which help man gather and process quickly the information he needs and use it in managing production and in his scientific activity. In the Soviet pavilions of the exposition there were on display about 200 different systems of machines and apparatuses. Included in them were computers; control and information search systems; equipment for compiling, copying, and reproducing documents; micro-photo copiers; and administrative-production communication, signalling, and other equipment.

The number of workers who are engaged in mental labor such as scientists, designers, engineers, and also specialists engaged in the sphere of management is constantly growing throughout the world. But up to now their labor has not been sufficiently mechanized. While during the last 100 years thanks to successes achieved in science and technology the productivity of labor in world industry has multiplied 15 times, productivity of labor in administrative-management work has been only approximately doubled.

Obviously the productivity of labor of scientists, engineer-technical workers, and salaried employees depends directly on the use of technical equipments which are now grouped under the name of organizational equipment. Organizational equipment is a new and growing concept. At first by it was understood the so-called means for minor mechanization (calculators and typewriters, dictating machines, copiers, and means for operational printing, card files and cards, equipment for operational communication and signalling). At the present time this term combines the entire complex of means for mechanizing and automating engineer-management work beginning with fountain pens, pencils, and drawing instruments and ending with the most complex dispatch installations and electronic computers for various purposes.

The use of organizational equipment in the sphere of management can increase worker effectiveness considerably. Even such simple devices as pencil sharpeners and rolls of thin transparent adhesive paper make it possible to reduce consumption of labor considerably. Organizational equipment will help bring the level of engineer-technical and management work in line with the present-day level of development in industry, science, and technology.

Various kinds of apparatuses and devices such as typewriters and typesetting machines, dictating machines, hectographs, rotators, small offset printing machines, a selective copier, and means for microfilming are now available to man for compiling, copying, and duplicating technical and business documents.

A dictating machine, for example, shortens the time needed to compose a page of typed text to 5--8 minutes and in conjunction with a centralized

typing bureau speeds up the compilation of documents by 10--15 times. Electric typewriters accelerate and simplify the work of typists and automatic typing devices make it possible to reproduce standard texts recorded on a perforated tape or magnetic tape at a speed of 600--900 symbols per minute. They avoid the need for counting the copies of a document.

The "Ukraine" typewriter types at a rate of 16 symbols per second. It advances and returns the carriage and underlines symbols automatically and requires very little pressure on the keyboard. The strike pressure of the keys can be adjusted to the number of copies being typed.

The principal method used to reproduce documents (drawings) is the diazotype photostating process (using low-sensitivity photostatic paper on which a positive impression is obtained). In design bureaus and design and scientific research organizations the SKA photostat apparatus is used. It produces copies on paper 100 mm wide at a speed of 5 m/min.

For operational reproduction of a small or medium number of documents use is made of operational printing equipment such as stencil machines (rotators), alcohol (hectographs) and offset printers, and also electrographic apparatuses. The "Vega-66" electrographic apparatus prepares a copy on ordinary paper or tracing paper from originals made with pencil or india ink which can be either typewritten or printed. If additional attachments are used it is possible to prepare offset printed forms on metal or paper plates and also to copy positive microfilms. The speed of operation is one copy every three minutes. The "Elektrofil'm" reading-copying apparatus makes it possible first to select a desired frame in a microfilm and then make a copy of it 11 times enlarged on ordinary or tracing paper.

An electrographic apparatus of the rotating type, the EFA-1M, reproduces 300 copies per hour which measure 297 by 420 mm.

Some models of operational printing apparatuses work at a speed of 6,000 copies per hour.

Microfilming makes it possible to reduce greatly the volume of documents kept in storage. The technical documentation for the manufacture of motor vehicles using the usual method weighs 17--20 tons and these same documents on microfilm weigh only a few kilograms. Microfilming texts is done on a UFM automated installation and microfilming of technical drawings on an FUST.

A very important part of organizational equipment is made up electronic machine such as numeric, alphanumeric, analog, and computer-perforation machines which involve manual input of initial data (adding, billing, bookkeeping, engineer), apparatuses for transmitting data, and also entire systems for automatic control included in which is computer equipment.

In the Soviet pavilion at the exposition various types of computer were displayed from the keyboard computer of the "Vil'nyus" and "Vega" types intended for bookkeeping and simple engineer calculations to digital and analog computers ("BESM-4," "Ural-11," "Kinsk-22," "M-101," and "M-171") which work either independently or in control systems.

The "Ural-11" general purpose automatic digital computer is used in scientific-research institutes, design bureaus, higher educational institutions, computer centers, and finance establishments, in a word, wherever planning-production, computation, statistical, information, and engineer problems are solved. It is also included in automated systems for handling data and processing information. The information is fed into the machine from perforated cards, magnetic and perforated tapes, communication channels, and continuous value pickups and is outputted on perforated cards, magnetic and perforated tapes, communication channels, regulators, printing devices, and automatic recorders. Up to 16 devices can be connected simultaneously for input and output. The machine performs addition and subtraction at a rate of

50,000 operations per second and multiplication at a rate of 25,000 operations per second. The small "Mir," "Mairi," and "Promin'-M" machines which are intended for automating engineering calculations in scientific research and planning institutes, design bureaus of large plants, and computer centers were also on display.

The "Mir" solves systems of linear algebraic equations to the 20th order and systems of ordinary differential equations to the 20th order, computes net diagrams consisting of 100 events, and performs many other tasks. It works at a speed of 1,000-2,000 operations per second. A computer algorithm is inputted into the machine and information outputted using an electric typewriter.

The "Mairi" computes elementary functions and solves algebraic equations to the 42nd order and other problems encountered in making engineer and economic calculations and scientific research. It can be operated by people who have not been trained in programming. When it is necessary to perform arithmetical operations and compute a series of functions the "Mairi" is shifted to the calculator regime and data are fed in using electric typewriters.

The "Promin'-M," just like the "Mairi," can be operated by very many workers who have not had special training in programming.

For operational control and transmission of production and economic information use is made of radio, telephone, radio-telephone, telegraph, phototelegraph, industrial television, and search call, and command signalling apparatuses and other equipment.

The "Rioni" telegraph apparatus, for example, is equipped with transmitter and perforating attachments and an automatic responder and stop. The "Aragvi" phototelegraph apparatus transmits documents prepared with india or other inks. 20 local and 120 long-distance lines, 20 loudspeaker 0.5-watt lines and 20 20-watt lines, and 5 connecting lines from ADS and TSB switchboards and 5 from subordinate dispatch centers are connected to the ADS-2 dispatch communication apparatus. It provides two-way loudspeaker and telephone communication between a central dispatch center and subscribers, one-way loudspeaker communication with subscribers without a preliminary call, two-way loudspeaker communication between the main dispatcher and dispatchers of subordinate centers and their subscribers, and two-way telephone communication between a dispatcher and subscribers in a city or telephone network through the nearest automatic switchboard (ATS). Furthermore, the ADS-2 makes it possible for the dispatcher to conduct a conference call among all or a few subscribers, connect two subscribers for telephone conversations, take part in their conversation, and record the conversation on a magnetic tape.

The automatic electronic-coordinating telephone substation of the PSKB-100 type is designed for 100 numbers (10 outgoing and 8 incoming lines, 2 lines for intracity communication, and 80 subscriber lines with a resistance of not more than 700 ohms each). It does not require servicing personnel and gives an automatic signal of damage to the ADS-47 or ADS-54 to which it is connected.

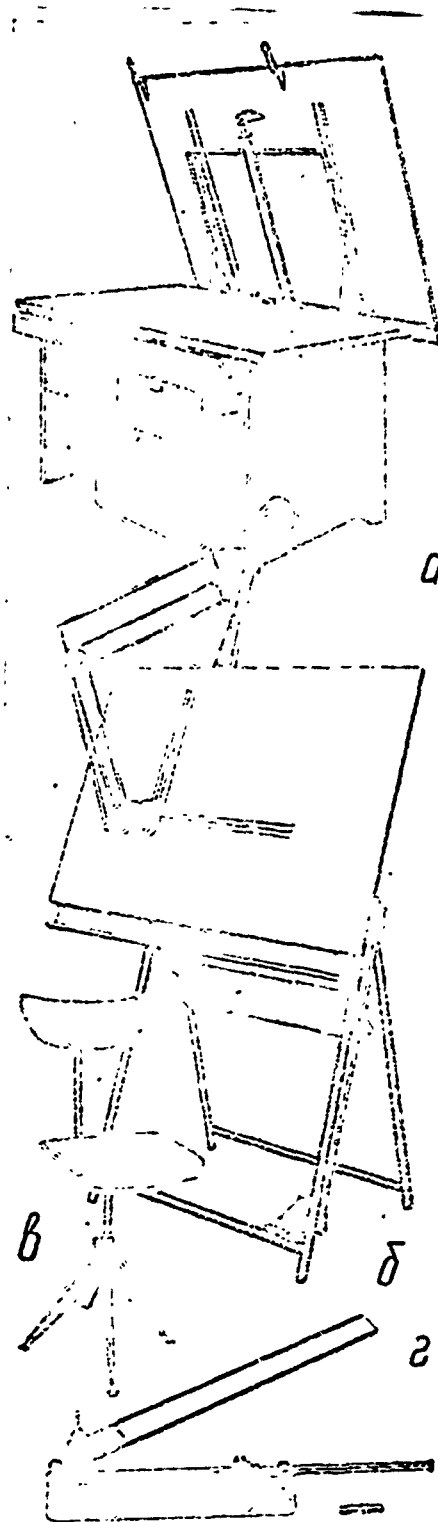
The ASHTS antinoise telephone communication installation makes it possible to conduct conversations with 24 subscribers through special telephone apparatuses installed in places where there is a high noise level. It provides for communication under conditions when the noise level reaches 100 dB.

Organization equipment is finding wide application in the USSR. Further development is proceeding along the lines of producing separate, special types of apparatuses for performing specific tasks and

also creating manually operated, semi-automatic, and automated integrated systems and technological lines for all the ways in which business and technical documents are handled. A large increase in production is foreseen during the Five-Year Plan of Development of the USSR Economy for 1966-1970.

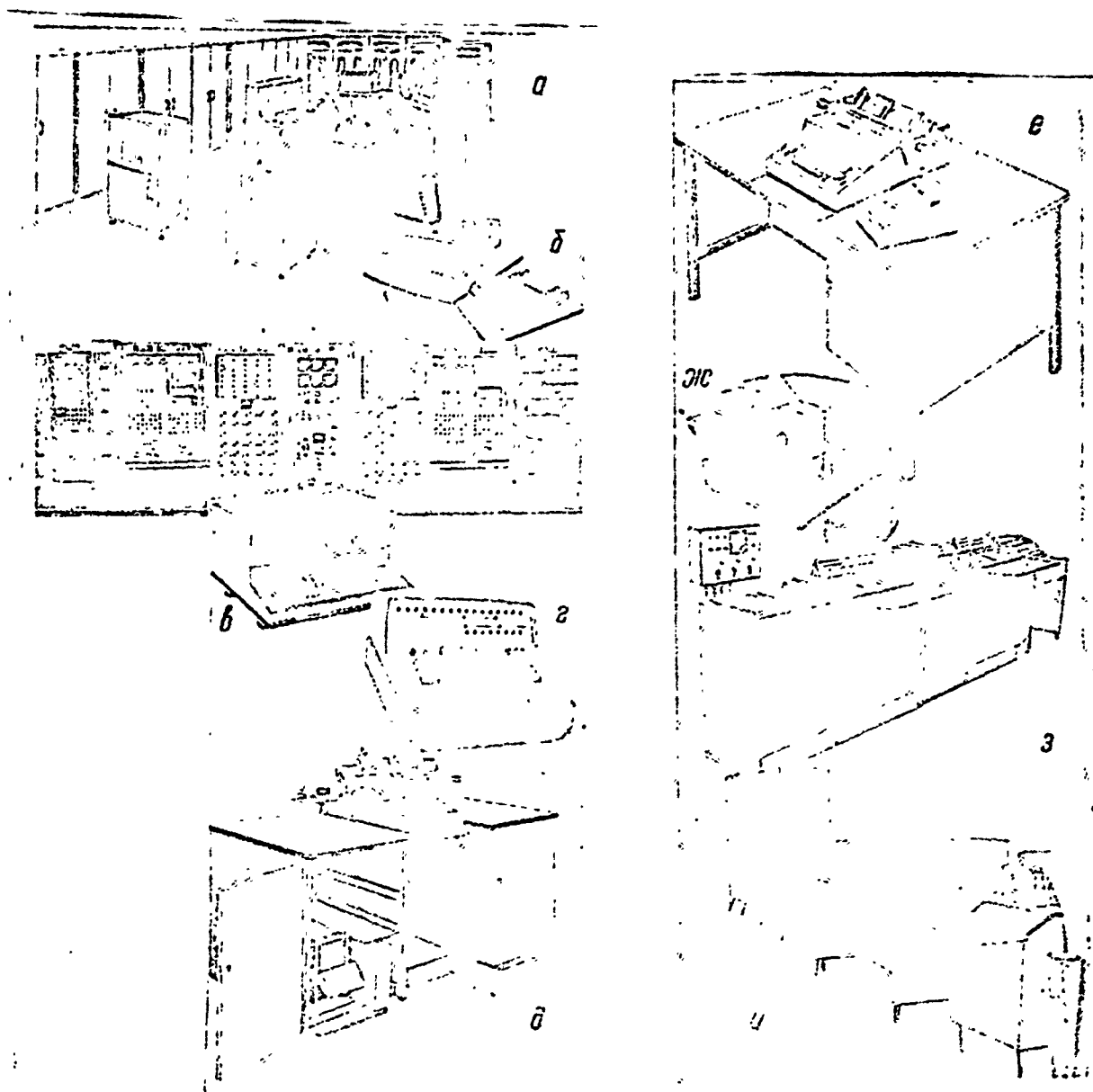
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Planners and designers spend a lot of their time producing drawings. In order to reduce the amount of labor consumed by these operations new methods for drawing planning-design documents are being used and work locations are being equipped with modern equipment.

Desks with a vertical board, the "Konstruktor-VI" (a) and the "Junior-5" (b), and an adjustable swivel chair (v) are convenient for this purpose. A drawing can be prepared on a vertical board using modern instruments much more rapidly than on a horizontal board using a T-square and triangle. The "Konstruktor-VI" table can be used from two sides and one can use it either sitting or standing. Unfolded drawings, instruments, and attachments, including a crosshatching device (g) with the help of which straight, parallel lines can be drawn at an angle to the vertical or horizontal axis are stored in the drawers. The distance between such lines can be adjusted within the limits of 0.1--10 mm.



Calculating equipment consists not only of electronic digital high-speed computers such as the "Minsk-22" (a) and the "Promin' 1" (b) but also analog or modeling computers such as the "TM-17K" (between b and v); computers which provide for manual input of initial data such as the "Vega" (v), "Vil'nyus" (g), the "Askota-L-20" (d), and the "Zentron-301" (e); and devices for input and output such as the "PL-150" (zh) and for storage of information such as the "Dnepr-11" (z) and "U-1" (i) control machines.

Analog computers are inferior to digital computers in general purpose application. On one and the same digital computer it is possible to solve various tasks in various fields of human activity (technology, economics, medicine). Analog computers are used in specialized organizations which perform identical computations over and over. They are simpler in design and do not require highly trained servicing personnel and complex programs. The "TM-17K" is used in managing enterprises and in chemical, aviation, motor vehicle, and other branches of industry where production depends on many conditions and parameters. It is able to solve two tasks at the same time.

The "Minsk-22" solves various planning-economic and scientific-technical tasks. Its advantages are its high speed (5--6,000 operations per second) and great memory capacity. It handles alphanumeric information and used a broad selection of input and output devices, including a typewriter.

(see page 96 for balance of caption to above figures)

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The "Vega" and "Vil'nyus" perform the four arithmetical operations and also raise to a power, extract a root, and do several other bookkeeping and engineering operations.

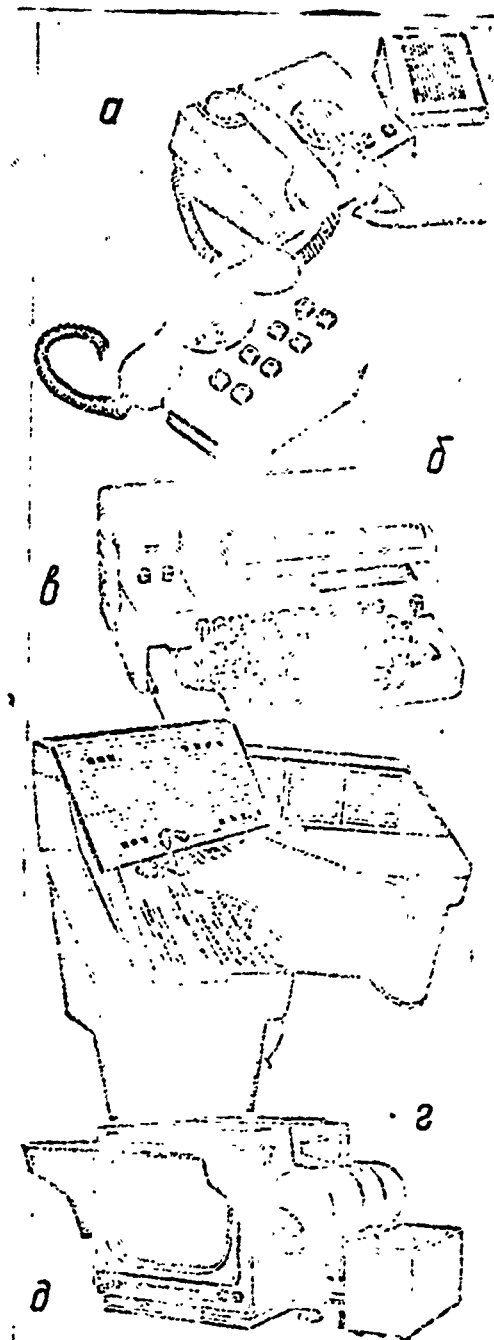
The "Askota-TM-20" is a complex consisting of two devices -- the automatic "Askota" calculator, Class 170/25, and the TM-20 electronic reproducing device. Preliminary calculations involving multiplication are performed simultaneously with basic and bookkeeping operations. As a result up to 30% of work time is saved.

The "Zemtron-381" electronic billing machine makes it possible to compute (add, subtract, multiply), collect results, and record automatically on blanks.

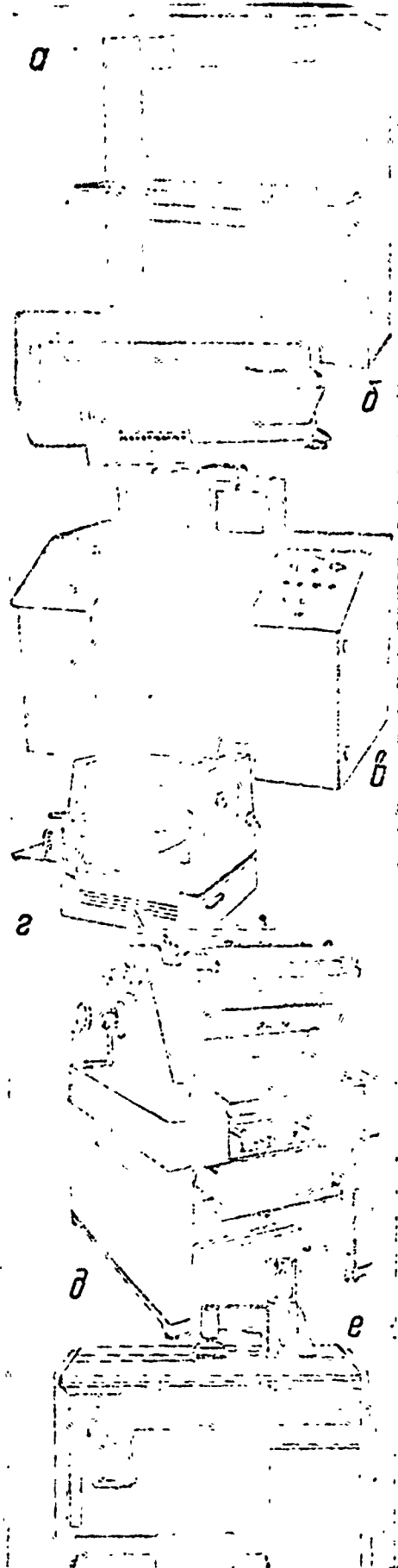
With the help of the "PL-150" tape perforator information from computers is outputted to a perforated tape. It is used for reproducing information from perforated tapes or cards.

The "Dnepr-11" and "UM-1" control machines are used for automatic control of technological processes in various branches of industry and for calculating optimal regimes for these processes.

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It has become very difficult to direct enterprises and the economy as a whole and to transmit business information with ordinary means of communication (telephone, telegraph, phototelegraph, radio) in view of the heavy load they carry. Therefore, use is now being made of means of operational-production communication and signalling. These means include such things, for example, as the "LF-66" loudspeaker telephone apparatus (a), the "Yefau-A-66" general purpose director's installation (b), the "T-63" telegraphic page printer, the "ADS-3" dispatch communication apparatus (g), and the "PTU-26" industrial television installation (d). They differ from ordinary means of communication only in the functions they perform. Subscribers have priority in using these means of communication.



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Technical means for compiling, copying, and reproducing technical and business documents reduce the time needed for processing information and release engineers and management workers from office work.

(see page 99 for balance of caption)

U.S. GOVERNMENT PRINTING OFFICE

(continuation of caption on page 98)

The "SKA" photostatic apparatus (a), the "Molniya" thermo-copier (b), the "KSM-2" contact printer (v), the "EFMA-1M" and "Gramaprint-A4" rotation-type electrographic apparatuses (g), the "Rotaprint" (d), and the "5002" electric printer (e) simplify the work of highly qualified specialists and make it possible for them to spend more of their time at creative work. For example, the "KSM-2" apparatus prints microcards and perforated cards from 35-mm perforated microfilms onto roll photo paper or a roll photo tape. Its productivity is 300 microcards per hour and 200 perforated cards per hour. The "Gramaprint-A4" prepares two-color prints with one pass of the printing paper. Its speed of operation is 34 prints per minute. The "Rotaprint" is a two-color machine. Its productivity is 6,000 prints per hour.

Anniversary congratulationsSCIENTIST AND TEACHER

Engineer-Colonel Yakov Semenovitch Itskhoki, doctor of technical sciences and professor, has reached the age of 60 and has completed 35 years of scientific and teaching activity.

Yakov Semenovitch began his life's work more than 40 years ago in a Leningrad plant. Working as an electrical installation man for a period of several years he prepared intensely to enter an institute. Then years of intense study followed in the Leningrad Polytechnical Institute imeni M. I. Kalinin. In 1935 Ya. S. Itskhoki completed the institute successfully. Teacher Itskhoki presented his first lecture within the walls of this educational institution and wrote his first scientific work there.

At the beginning of the Great Fatherland War this scientist went to the front but in 1942 he returned to his teaching in the Military Air Engineer Academy imeni Professor N. Ye. Zhukovskiy. Since that time -- almost a quarter of a century -- he has trained engineers for our Air Forces.

Ya. S. Itskhoki is a prominent scientist and one of the foremost experts in the field of pulse devices and methods for discrete handling of information. His activity is many-faceted. Included in the circle of interest of this scientist are basic research, practical application of this research in producing various radiotechnical devices, training scientific cadres, and participating in discussions of manuscripts and scientific works.

During the many years of his teaching activity Yakov Semenovitch has trained many tens of young scientists. Included among his students are more than 40 candidates of technical sciences and 4 doctors.

Yakov Semenovitch is not only a prominent scientist and teacher but also an active author. He has written over 80 scientific works.

Seventeen years ago in 1949 the first monograph on pulse equipment was published by the "Soviet Radio" Publishing House. The author of this book was Ya. S. Itskhoki. Later, in 1955, he produced another important work in the field of nonlinear radio equipment and in 1959 a book on pulse devices.

Recently Ya. S. Itskhoki, in collaboration with N. I. Ovchinnikov, prepared a manuscript on transistor pulse devices for publication. He is now writing a book entitled: Calculating Pulse Radio Electronic Circuits about which he has thought for a long time. Yakov Semenovitch is a permanent member of the main editorial council of the "Soviet Radio" Publishing House and also a member of the editorial board of the magazine Foreign Radio Electronics.

Ya. S. Itskhoki does not envision his work as a teacher as being separate from publishing something. For his active participation in the work of volunteer editorial councils Professor Ya. S. Itskhoki has been awarded the badge "Excellent Man of the Press" by the Committee for the Press of the Council of Ministers of the USSR.

Even after passing the age of sixty Yakov Semenovitch Itskhoki is filled with creative energy. We wish him good health and many more years of creative activity which will contribute to strengthening the defensive might of our Motherland.

WE INTRODUCE WHAT IS FOREMOST

By Engineer-Colonel Z. Kominarov

The collective of workers in our enterprise has won the transferrable prize of the Leningrad Military District for best organization of the work of innovators for the fourth time.

Innovators constantly strive to use in production the technological innovations displayed at the exposition of achievements of the economy of the USSR. Many stands and attachments have been prepared and mastered. A stand for testing the seal of heads on ZIL, GAZ, and YaAZ motor vehicle engines, for example, made it possible to mechanize the testing process completely. No less useful was a stand for testing the oil pump of a YaAZ-204 engine.

Thanks to the fact that we use a general purpose pneumatic attachment for disassembling couplings on the ZIL-130, ZIL-164, and YaAZ-204 motor vehicles, productivity of labor has increased 20%. For assembling couplings on the ZIL-130 motor vehicle we use another attachment of original design which has rotating pneumatic clamps and a pneumatically operated nut turner. We have managed to reduce the time needed for assembling a coupling by 1.5 times.

We use an RS-22 drill equipped with a special device which holds the tool for boring the pawl openings in spring brackets (without removing them from the frame) and also in the frame of several large-dimension items of non-standard equipment. This simple device increases productivity of labor by 30%.

We use brake chambers in an installation which serves the purpose of heating a rim before pressing it on the flywheel of ZIL-120, YaAZ-204, and M-20 engines. The rim is pressed against the contacts of an induction heater and is released quickly just prior to the pressing process. This makes it possible to maintain the temperature regime required for this technological process.

When wooden bodies on motor vehicles are disassembled the metal bindings are usually badly damaged. In order to avoid this we have set up production of pneumatically operated cutting pliers for M10 nuts. As a result we not only save material but we have raised the productivity of labor.

We are completing the installation of a hydraulic mount. When it is put in operation one of the most labor-consuming operations -- pressing out the king-pins of a front axle -- will be mechanized. We are doing experimental work in spraying thin layers of polyamides when repairing cabs and fenders and also honing engine cylinders with synthetic diamonds.

The introduction of new and progressive methods of repair and more improved technological equipment makes it possible to improve production constantly. The gross output for the first half of 1966 in comparison with the first half of 1965 grew by 8% while the number of people occupied in production decreased by 1.5%. Productivity of labor in comparison with that planned grew by 3.7% and exceeds the growth in average monthly wage by 4.5%. Prime cost of goods produced was reduced by 0.3% over that planned.

The creativity of innovatorsBLACK SEA FLEET INNOVATORS

By Engineer-Captain 1st Rank V. Podzorov
and
Engineer-Captain 2nd Rank V. Smirnov

Innovators and inventors give a great deal of help in solving the countless and complex tasks which are performed on ships and in troop units of the Red Banner Black Sea Fleet. The faultless knowledge of weapons and combat equipment, lively and restless mind, and fervent patriotism of sailors-innovators contribute to raising the level of combat readiness and combat training on ships and in chast'.

Members of the creative collective headed by Captain-Lieutenant Gusev have worked hard. They have created a stand for testing several instruments in a machinery installation. The introduction of this suggestion made it possible on one hand to increase the reliability of installation operation and on the other to train engine operators so that their practical training would always be at the proper level.

Sulmariners made a training device for developing skill in handling weapons. Airmen created a command post for an engineer and produced a suggestion for equipping parking areas which made it possible to prepare combat aircraft for flight in a shorter period of time.

Training podrazdeleniye do not lag behind combat ships and chast'. In the Black Sea Higher Naval School imeni P. S. Nakhimov, for example, a special teaching device was suggested which helps officer candidates develop skill in servicing weapons and combat equipment. Officers, petty officers, and sailors on ships also use the teaching device.

In the same school Officers (Reserve) A. Sobachkin and G. Litvinenko developed a pickup for random numbers which obey the normal and equal probability law of distribution. This portable device is irreplaceable in the conduct of command-staff exercises and it obviously will find wide application even outside the fleet.

In 1965 personnel in the fleet submitted 15 claims for inventions and they received three author's certificates. This year Petty Officer 2nd Class A. Chirya received an author's certificate for an invention.

Commanders and chiefs at all levels, political workers, and Party and Komsomol organizations, fleet invention bureaus, and invention commissions give a great deal of help to innovators.

In March a conference of innovators and inventors was held at which fleet headquarters summed up the results of the work done in 1965 and assigned tasks on successful completion of which further development depends. Innovators exchanged experiences and pointed out the shortcomings which were hindering them. During the conference an exhibit of inventive creativity was opened. The displays in the exhibit were of great interest to conference participants. Many officers and sailors made notes and sketches so as to make use of them on return to their ship or chast'.

The thematic tasks assigned to innovators and inventors which are on hand on all ships, in chast' and educational institutions, and at enterprises give direction to the work. On ships and in troop chast' monthly contests in submitting and realizing innovator's suggestions are held and competition is conducted in the best state of innovating work.

The political administration of the fleet has used posters and leaflets which publicize the best innovators. Articles about the work of innovators are published systematically on the pages of the fleet newspaper Flag of the Motherland.

Workers in the Bureau of Inventions headed by K. Ivanov play a significant role in promoting inventing and innovating in the fleet.

Black Sea sailors, in applying their creative labor to weapons and equipment, to the methods for use and repair of them, and to training devices, try to make the results of this labor the gain of many people. For this purpose descriptions of the most valuable innovator's suggestions are published in information bulletins. Individual models made in accordance with the suggestions of innovators are centrally distributed in the fleet. They are prepared and sent to ships and chast' for use. For example, 250 copies of one item were made as a result of a suggestion.

The suggestions made in other fleets are widely introduced. Thirty-nine suggestions developed by innovators of the Twice Red Banner Baltic and Red Banner Pacific Fleets were accepted for introduction from January to September of this year.

But it would be incorrect to think that all reserves for further uplift in the movement of innovators and inventors have been utilized and all shortcomings eliminated.

Some commanders and chiefs, unfortunately, still do not understand what an important lever, innovating is in carrying out assigned tasks. Therefore, they do not head the commissions on inventions and are not concerned with directing creative thought along the necessary channel.

Many suggestions are adopted which contribute in no way to increasing the level of combat readiness, the level of combat training, or the daily activity of ships and chast'. On some ships suggestions come only from personnel in the BCH-5 and on other ships mainly from sailors, petty officers, and officers in the BCH-2 or repair technical station (RTS). At the same time technical difficulties, in overcoming which innovators could render great aid, are encountered in all combat units and services.

There are instances of long delay in reviewing suggestions. Some commanders and chiefs and commissions on inventions are not thoroughly acquainted with directives and this often leads to mismanagement in spending money allotted for innovating because of incorrect relegation of suggestions to the category of innovations.

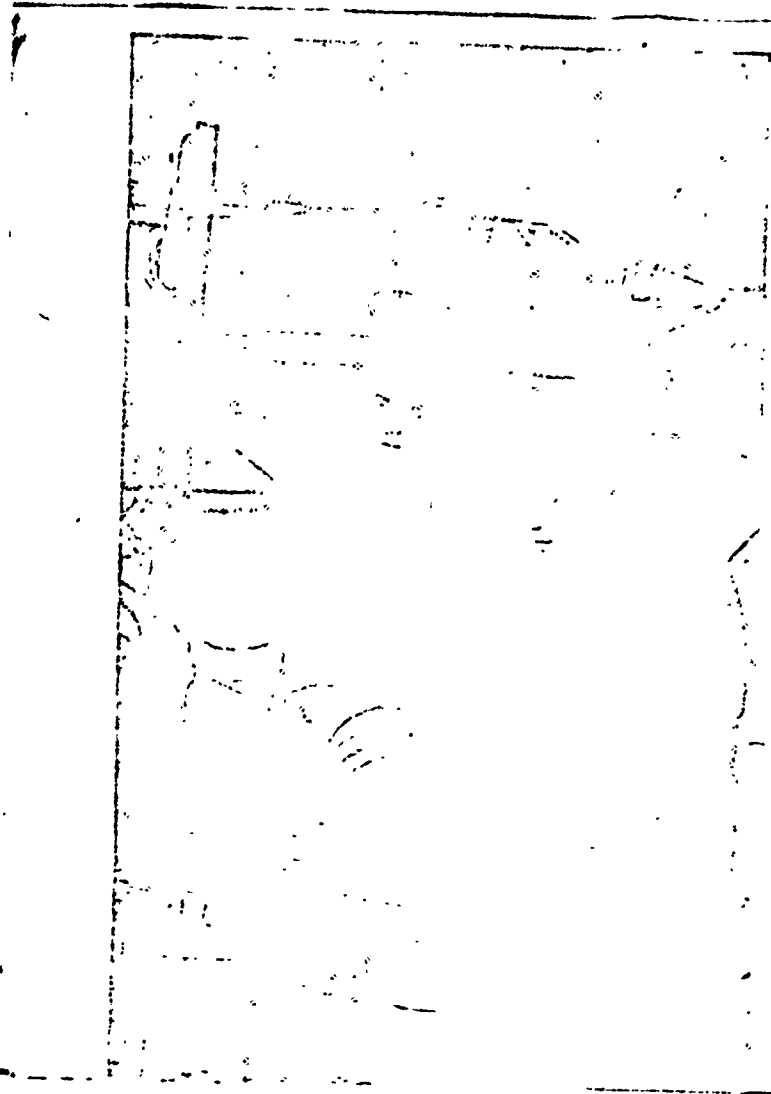
With good imagination alone it is possible to recognize as an innovator's suggestion a chair for study rooms, a desk for a company charge of quarters, a drill holder (incidentally, it is sold in stores in a set with screw-cutting dies and tap-borers), lighting for voltmeter and ammeter scales, a grate fitting for an ejector, and so on. And, unfortunately, similar suggestions are regarded as innovator's suggestions in some chast'.

It is unfortunate that sometimes insufficient attention is devoted to the introduction of suggestions and they remain for years on paper without bringing the good which they might.

There is no doubt that collectives of innovators and inventors and also those who organize the work of inventing will apply all possible effort toward eliminating these shortcomings in the shortest possible time.

Innovators and inventors in the Black Sea Fleet are completely capable of winning victory in the competition in technical creativity which

is being waged among fleets and of greeting the 50th anniversary of Soviet Power in the Armed Forces with new creative successes.



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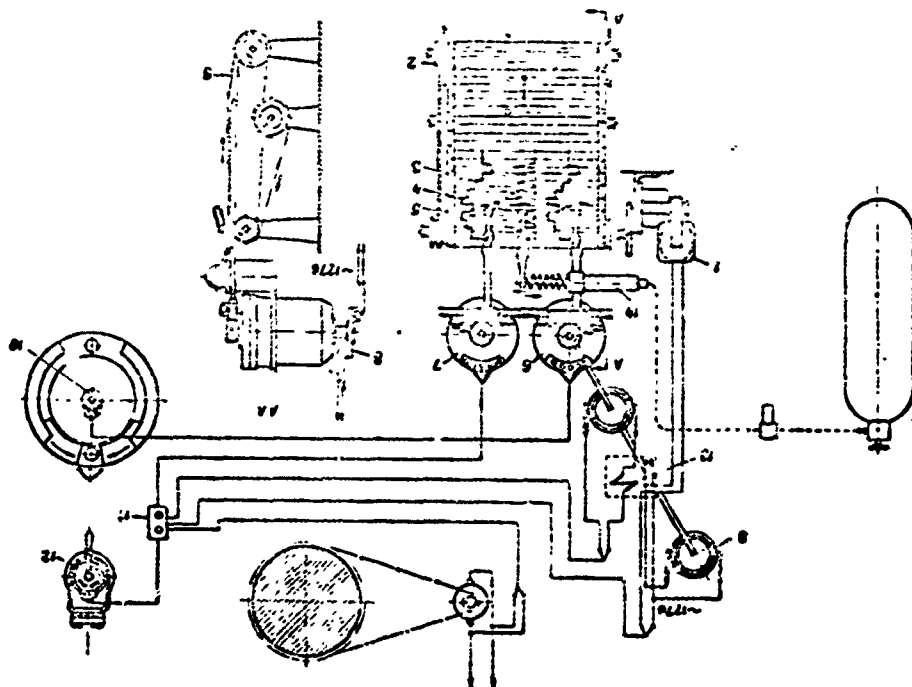
Work is humming as usual in a technical operations chast' (TECh) area. Here they know how to value time. The aircraft which are now undergoing technical inspection are awaiting their pilots. This is why Technician-Senior Lieutenant S. Muslimov (right) and Junior Sergeant I. Zavadskiy are working so intently. Photo by Ye. Simakov.

Author's certificate issuedAN AUTOMATIC MONITORING DEVICE

A device which records the performance of a ship's main engines and monitors the timeliness and correctness of execution of the commands given has been suggested by A. A. Kiryuchchenko, B. A. Mshanetskiy, T. M. Begagoyen, and D. L. Gol'd (Author's Certificate No. 1148 732). Its line diagram is shown in the figure. The electric motor, 1, drives the tape-winding mechanism, 2, at a constant rate. A recording device, 5, records on the tape, 9, the command given from the bridge through the engine room telegraph and another recording device, 3, records command execution. Recording Device 4 is intended for the purpose of recording changes in the pressure of start-up air behind the shunting valve (for diesel engines). The command selsyn-pickup, 12, is linked mechanically with the arrow of the engine room telegraph and electrically with the selsyn-receiver, 7, which controls the recording device, 5. The command execution selsyn-pickup, 10, is linked mechanically with the maneuver controls at the engine control post and the command execution selsyn-receiver, 6, with Recording Device 5. Recording Device 4 is connected kinematically with the pressure pickup of the start-up air, 14.

Voltage is delivered through the voltage box, 11, to all elements in the electric circuit. Recording Devices 3 and 5 occupy positions corresponding to positions of the arrows on the engine room telegraph and the maneuver controls of the engine control post. The electric motor drives the tape winding mechanism. When the ship's engine is not working the voltage is delivered to the motor through contacts 8 which are attached to the axis of Selsyn 6. When the engine is operating the electric motor draws its current through the control relay, 13, voltage to which comes from the tachometer generator of the main engine.

In this way, if for some reason the engine does not start, Recording Device 3 traces only a horizontal line on the tape since the electric motor does not draw power and therefore the tape winding mechanism stops. When the arrow of the engine room telegraph and the maneuver controls of the control post are set on "Stop" and the engine continues to work, Recording Devices 3 and 5 trace only vertical lines.



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EXPERIENCE AND INITIATIVE

* Guards Senior Lieutenant B. Skipin tells us that it is possible to bore brake shoes of ZIL-150 and GAZ-63 motor vehicles with the help of an attachment which is intended for boring brake drums (see Tekhnika i Vooruzheniye, No. 5, in the section "Experience and Initiative"). Included in the attachment set is a bearing brake disk (from the rear axle housing of a motor vehicle which has been dropped from the records) in which holes are bored for seating it on the pins of the semi-axle. The force-open lug of the shoes is cut at the place where it emerges from the bearing bushing and welded to it. The clamping spring is replaced by a cleat which has a thread.

After removing the wheel from the motor vehicle the disk is placed on the semi-axle pins and held to it with four nuts. The brake shoes are mounted on the disk. Their position is adjusted with steel plates which are inserted between the force-open lug and the end of the shoe. The shoes are compressed by the clamping cleat and then bored.

* A training stand made in a tank school makes it possible to practice the initial elements of prescribed standards in checking the power transmission drive control subassemblies of a tank. This has been reported to us by Engineer-Major Ye. Nemykin. The stand is also used for studying devices in power transmission subassemblies of a tank and the controls.

The base of the stand (Figure 1) is welded from corner iron and covered with sheet steel. That part where the control levers and pedals are mounted has the same shape and dimensions as the compartment where the mechanic-driver sits.

On the base there are mounted an adjustment plate, 3, a main friction clutch, 5, a gear box, 8, a planetary turn mechanism, 9, a right side transmission, 4, and a fan, 6. The control levers and pedals, 11, are connected with subassemblies through tie rods, 10, made from rod material 16--22 mm in diameter. The drive for the subassemblies is provided by an electric motor, 2, which produces 4.5 kilowatts. It transmits a turning movement to the drive shaft of the adjustment plate through a step-down reduction gear, 1 (from the turret turn mechanism), and a chain drive, 7.



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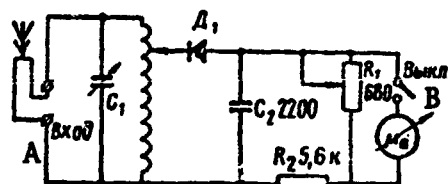
* An instrument (Figure 2) which makes it possible to record the directivity diagram of complex directional antennas while they are being tuned and regulated has been developed by Private A. Loginov. The input part of the instrument is a resonance circuit which reduces the effect of other transmitters considerably. The antenna is a symmetrical vibrator made from two tubes 50--100 cm long. In the circuit of the instrument there is a microammeter of the M-24 type with a scale registering 150 micro-amperes. Its winding resistance is 600 ohms. The device is included in an aluminum housing measuring 130 X 130 X 60 mm.

The resonance circuit is tuned prior to beginning measurements to the transmitter frequency and the required instrument characteristic is set with the potentiometer, R_1 . In order to record the directivity diagram the instrument is located at a distance equal to several wavelengths from the transmitter antenna. The position of the instrument antenna must be in keeping with the type of polarization of the emitted signal. Depending on the expected width of directivity diagram the measurements are performed at different angular intervals such as 1.2--3° or 5--10°. The fixed antenna directivity diagram is constructed based on the results of measurements using rectangular or polar coordinates. For this purpose the field intensity indicator readings with a random angle of rotation pertain to the maximum reading.

Legend:

A Input

B Switch



* The transmitter emission indicator (Figure 3) designed by Private A. Loginov amounts to a simple diode detector with a direct current amplifier and a sensitive relay, the operating current of which is about 2 mA. The circuit can function using signals received by a small-size antenna. The inductance of the coil and the capacitance of Capacitor C_1 is selected depending on the frequency of the transmitter. Rectified by a D2Ye diode, the radio signal is amplified by a 6N01 triode and causes Relay R to function. The contacts of this relay close the signal circuit. If there is no signal the circuit of the indicator is not closed.

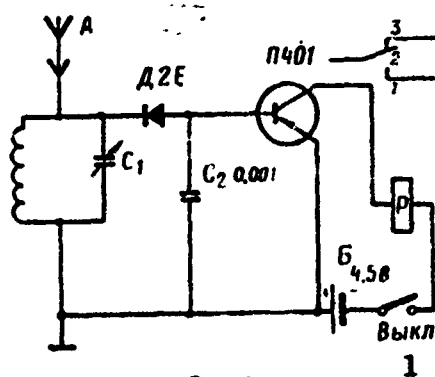


Рис. 3.

Figure 3.

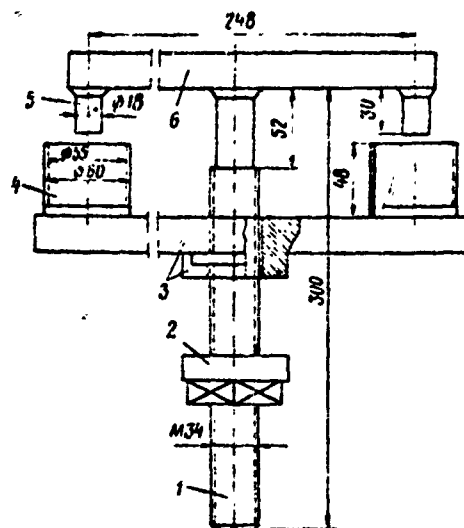
Legend:

1 -- Switch

* A device for assembling and disassembling the main clutch of armored artillery prime mover (BAT) road-layers and high-speed trench-digging vehicles (BTH) has been made by Innovator A. Iis'kevich.

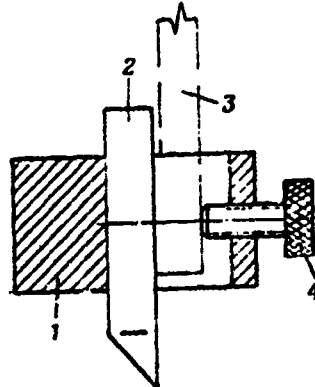
A screw, 1, and two support pawls, 5, are welded to a plate, 6 (Figure 4). A holding transverse member, 3, with two cylinders, 4, welded to it slides freely on the screw. The position of the transverse member is changed by using the shaped nut, 2.

In order to disassemble the clutch the shaped nut of the device is unscrewed, the holding transverse member removed, and the main clutch is placed on the screw (holding nuts up). At this time the support pawls are located between the clutch pins. The two nuts of the friction springs are unscrewed and then the holding transverse member is placed on the screw. It is compressed and the remaining nuts of the springs can be unscrewed. Assembly of the clutch is done in reverse order.



Puc. 4.

* Laying out large-dimension parts can be done with the precision of 0.05 mm using a device suggested by Innovator G. Rechitskiy. It consists of two frames with screw clamps (Figure 5) and stylus-type markers. The frame, 1, with a stylus, 2, is set in the jaws of a slide gage, 3, and held with a screw, 4. The device can be made easily and it is convenient in operation according to Engineer-Lieutenant Colonel N. Rakhmanov and A. Vasiychuk.



Puc. 5

* A counter to record the number of rounds fired has been suggested by Major A. Leonov and Private 1st Class Ye. Gorda. The sound wave coming from a shot acts on the membrane of a sound receiver which is connected in a direct current circuit in series with a polarized relay. The relay functions and actuates an electromechanical counter consisting of a step-type distributor and a set of numbers.

* An extractor for pressing out the pawls in the stopping brake of the planetary gear mechanism (PGM) blocking device on armored artillery prime mover (BAT) road layers, high-speed trench-digging vehicles (BTM), and AT-T prime movers has been made by a group of innovators. In the cylindrical housing of the extractor, 2 (Figure 6), there is a shaped out and a threaded opening into which a step screw, 1, is turned. The upper end of the screw has a four-sided head to which a nut wrench is applied. The lower end of the screw engages the pawls of the blocking device. In order to press out a pawl, Nut 4 is turned with Handle 3.

Engineer-Lieutenant Colonel V. Solomenko informs us that using the extractor doubles the productivity of labor.

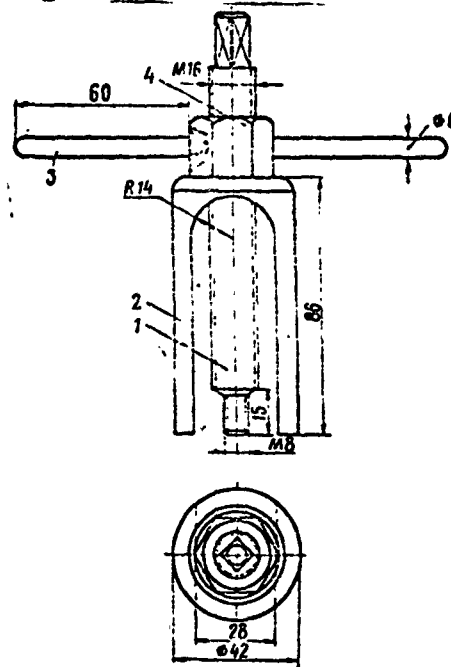


Рис. 6.

*Lieutenant Colonel A. Degtyarev informs us that a special net is convenient when clearing boulders and other heavy objects from the bottom of a river. The framework of the net consists of a loop made from 19-mm cable the ends of which are fastened by clamps. The mesh of the net is woven using cable measuring 4-5 mm in diameter. The size of the mesh is 20 X 20 cm. The cables are bound using a sea knot. For raising loads to the deck of a cutter or ferry the net is made round in shape (Figure 7, a) and if boulders are to be thrown onto a bank using a winch or prime mover it is convenient to use the net in a rectangular shape (Figure 7, b).

In order to hold the ferry from which diving operations are being carried out in place when the current is strong it is advisable to use a simple device and a winch (a motor vehicle or a prime mover can be used) to draw a cable having a diameter of 19-20 mm across the river.

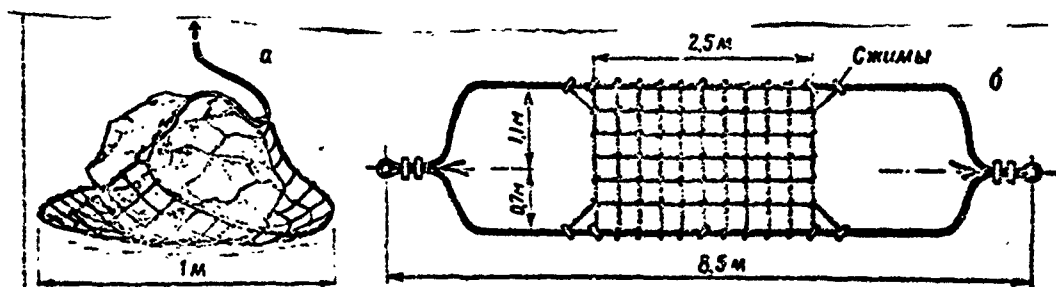


Figure 7.

* The FARM-2 photo attachment can be used for automatic photo monitoring of all-round vision indicators on a radar (ALS) working at a command post (KP). Major V. Grigor'yev and Captain G. Babushkin tell us that for this purpose it is necessary to modify it only slightly.

In the ShR32P12ESH1 shoe (see the electrical line diagram of the FARM-2) the lead (Cable No. 1) from the sixth foot should be resoldered to the seventh and the lead from the seventh foot resoldered to the sixth. The lead coming from Resistor R_2 is unsoldered from contact KP_{11}^H and reconnected to contact KP_{11}^H . It is necessary to saw off three ¹¹ pairs of lugs on the disk, 10, of the time drum in the command instrument, leaving only one pair. This will provide an exposure time of 40 seconds. After work on the FARM-2 had been completed photographing with exposure times of 2.4, 40, and 20 seconds is provided and recharging is done in a period of 0.75 seconds.

Uninterrupted photo monitoring of the air situation at the all-round vision indicator (IKO) is done through a tube which can be made easily (Figure 6).

In order to increase exposure time, in addition to the indicated changes it is also necessary to modify the reducer. For this purpose it is necessary to remove two rods (20 and 40 teeth) from the axles and rebore the openings to a diameter of 5 mm. Then it is necessary to place the rod with 20 teeth on the axle of the conical rod and fasten it. The rod with the 60 teeth must also be removed and an opening with a diameter of 3 mm bored in it (in the center). The axle is cut at the hub and the rod fastened to the axle of the lug. After these modifications the speed of rotation of the drum is cut by one-sixth. This provides exposure times of 12 and 24 seconds and 4 and 2 minutes. The amount of film used in 30 hours of operation is 12.5 m (2 cassette).

In order to increase reliability and life of the command instrument the rod which has 20 teeth can be replaced by another having 22 teeth.

The module will remain the same as that for the rod with 20 teeth and only the diameter will be increased.

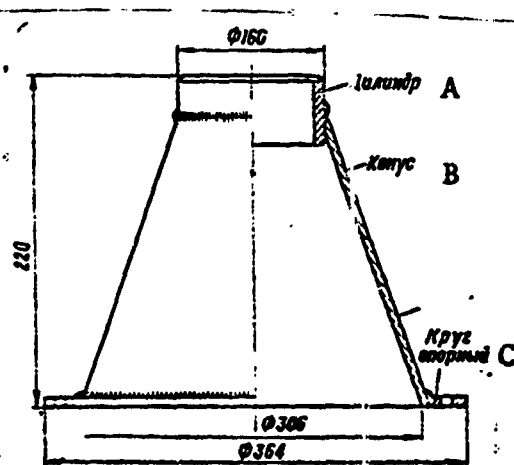


Figure 6.

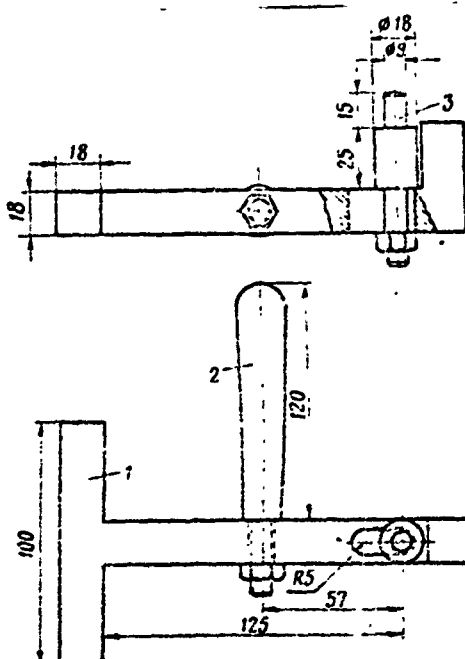
Legend:

A Cylinder

B Cone

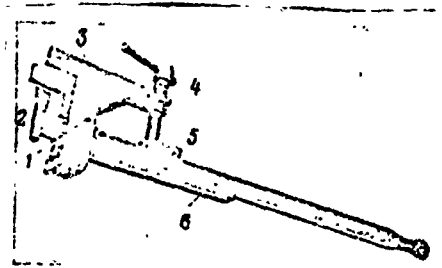
GRAPHIC NOT REPRODUCIBLE

Using the template avoids incorrect installation of rocker arms and increases the productivity of labor by two or three times. This information was sent to us by Engineer-Lieutenant Colonel V. Solonchenko.



GRAPHIC NOT REPRODUCIBLE

* The screws and nuts which are used to attach the rotor racks of a high-speed trench digger (BT) can be used again if when disassembling the rotor a device suggested by Innovators A. Gladun and V. Zavadskiy is used. It consists (Figure 10) of a clamp, 3, and a lever 6. The clamp is held on the lever using a pawl, 1. The tooth of the pawl, 2, is put in the slit in the rack screw and then the lever is fastened to the rotor using the screw, 4. When the end of the screw enters one of the grooves, 5 (this prevents turning of the lever) a wrench can be used to remove easily the nut on the screw holding the rotor rack.

GRAPHIC NOT REPRODUCIBLE

* Engineer-Captain S. Volkodav informs us that access to the commutator and brushes of a generator in a AB-1-P/30 subassembly can be simplified in the following way. It is necessary to change the shape of the control unit housing somewhat. Remove the fuel tank from the subassembly and the upper lid of the control unit. Disconnect the leads going to the generator and remove the control unit. Mark off and cut out two windows on the side wall of the unit. After this put all units of the subassembly in place and the bolts holding the lid of the commutator hatch can be easily screwed on and off.

IN CAPABLE HANDS

By Major M. Plakhotnik

The battery had received a mission of executing a march of many kilometers and being ready to support swift forward movement of attacking troops.

Guards Captain H. Zabelyy, the battery commander, made an estimate of the situation and studied on his map possible routes for reaching the indicated area. There were several of them. He could circle wide, using highways and dirt roads, or he could go straight to the area. The commander rejected the first two routes immediately. There was not enough time. He decided to move straight ahead, over sand, swamps, and steep slopes. The commander felt confident of success. The battery had already executed marches many times under difficult conditions and the drivers always displayed skill in handling their tasks.

The swift march began. The battery crossed contaminated areas several times. The drivers had to wear their gas masks but they maintained the prescribed speed. There were no breakdowns along the way.

The battery reached the assigned area on time. The artillerymen needed much less time than called for by prescribed standards for the rating of "excellent" in occupying their firing positions. They began to prepare data for firing from covered positions. The downpour which was falling did not bother them. They delivered fire by individual gun and the results in every case were the same -- "excellent." Night firing was no less successful.

At the exercise critique the senior officer gave a high rating to the level of training of these guards artillerymen.

Success was achieved thanks to the fact that the officers in the battery are rated excellent in tactics and firing. They are capable instructors and experts in handling their equipment and weapons. The battery carries out firing missions year after year with ratings of only "good" and "excellent." But these guardsmen were not content with what they have achieved. They decided to increase precision of firing and exceed prescribed standards in their combat work. This was facilitated by training sessions and by the searching of innovators. Officers in the battery developed a special rule which made it possible to prepare data for firing from covered positions much more quickly and precisely.

Innovators have increased the capabilities of organic equipment for performing special processing of equipment and guns. They installed two additional tanks for radioactive decontamination solution on the frame under the vehicle body and connected it to a pump. It is now possible to decontaminate guns and equipment at the same time and then perform processing of personnel in the shower transported on this vehicle. Thanks to this it has become possible to cut prescribed standards in half.

During the summer the battery took part in all-army artillery firing competition and demonstrated a high level of skill.

Enrolling in socialist competition in honor of the 50th Anniversary of Soviet Power, officers, sergeants, and soldiers assumed high obligations. And they are fulfilling them. Prime mover drivers Guardsmen V. Sigitov and Ye. Pridachin, scouts Guards Private 1st Class V. Zenin and Guards Private M. Kharchin and others have raised their ratings. In the reconnaissance squad commanded by Junior Sergeant V. Larkovskiy all soldiers in their second and third years of service have become highly qualified specialists.

Many artillerymen have mastered related specialties. Now in almost every crew there is an alternate prime mover driver and gunner. Their readiness to replace their comrades has been proven in practice.

The technical knowledge which these artillerymen acquire help them carry out all missions successfully. These soldiers care for their weapons well and hit targets with precision. The names of gunners Privates 1st Class V. Veretennikov and P. Popov are well known in the chast'. Artillerymen are now taught how to operate their guns based on the experience of these men.

These guardsmen are struggling to win the title of excellent battery. They are close to their goal. The platoons commanded by Guards Lieutenants V. Mazokhin and V. Krivul'kin, the crews commanded by Guards Senior Sergeant V. Anenko and Guards Sergeant V. Pudovkin, and the reconnaissance squad commanded by Guards Junior Sergeant V. Markovskiy have all been rated excellent.

These artillerymen are carrying out their other obligations successfully. More than half of these guardsmen greeted the 49th Anniversary of Great October marching in the ranks of those rated excellent. Personnel in the battery commanded by Captain N. Zabely are making a worthy contribution to strengthening the combat readiness of our Armed Forces.

[Pages 76--87 of Russian text not translated.]

In the world of booksDEVOTED TO AN IMPORTANT PROBLEM

By Engineer-Major Ye. Bogdanov

A book which was published recently under the title Selection of Moving Targets* is devoted to an important problem -- ways of identifying the signals reflected from moving objects against a background of fixed objects. [* Vishin, G. M. - Selection of Moving Targets. Moscow, Military Publishing House, 1966, 276 pages, 56 copecks.] In the first chapter the author discusses methods of selection and gives a detailed analysis of interfering reflections. He classifies their sources (passive interference, sea surface, clouds, and precipitation) and evaluates the phase and amplitude fluctuations of interfering reflections. Here he explains the essence of coherent-pulse and several other methods of selection and introduces the concept of stroboscopic effect and blind speeds.

The second chapter is devoted to coherent-pulse systems of moving target selection (SDTs). In the chapter the author discusses spectra of reflected signals and systems with internal and external coherence. Vector diagrams are used to explain the phasing mechanism. The extensive use of diagrams in the book makes it easier for the reader to understand many complex points. The relative simplicity and accessibility of the mathematics presented is one of the merits of the book. For each of the problems he brings up, the author tries to give the reader exhaustive information. For example, he presents eight variations of constructing coherent-pulse systems, bearing in mind that systems with a coherent heterodyne have received widest application.

In the third chapter the author analyzes methods of suppressing interfering reflections. The problem of identifying useful signals, as is known, cannot be considered finally resolved until interfering reflections are precluded from the receiving-indicator channel of a radar. Therefore, he takes up the two main methods of suppressing interfering signals and gives a detailed analysis of them. These methods are the spectral and compensation methods. Inasmuch as the spectral method is based on using the differences in spectra of signals reflected from moving targets and from fixed objects, in his book the author presents an evaluation of the number of spectral components of interfering signals which must be suppressed and also presents a consideration of a comb filter for reliable suppression of such signals. In this chapter he gives a very complete analysis of the compensation method and the method of periodic computation which is very often used in modern SDT apparatuses. Here the author presents much practical information. For example he gives detailed descriptions of electromagnetic and ultrasonic delay lines, the design of them, the mechanics of reflection in them, and so on. He presents the principles of signal compensation and line diagrams of compensating devices and their most typical elements. Introducing the reader to the essence of secondary electronic emission, the author gives a detailed description of the design and functioning of the subtracting potentialoscope which is one of the important elements in modern compensation systems.

The fourth chapter is devoted to general principles of design and distinguishing features of coherent-pulse systems. In the fifth chapter the author lists the principal demands made of SDT systems. He gives a detailed analysis of the effect of instability in the functioning of a modulator on the quality of compensation and also instability of frequency of repetition trigger pulses and instability of duration of a modulating pulse. Along with theoretical matters the author presents much practical information here. For example, he shows how the range of action of a radar changes in the SDT mode and he discusses compensation of fluctuations in interfering reflections and also peculiarities of checking the stability of a transmitter in the SDT regime. He informs the reader how to evaluate transmitter frequency drift

from pulse to pulse. He gives recommendations about checking the stability of a receiver heterodyne and a coherent heterodyne. He sets forth the method for checking the stability of a transmitter and measuring the damping of signals in ultrasonic delay lines and so on. All this information, unquestionably, helps the reader gain an understanding of the physical processes behind the tests and gain a detailed familiarity with the method used to conduct them.

A few reservations about the book must be mentioned. For example, in explaining the essence of the doppler effect with respect to radar (Page 23) the author mentioned the fact that the conclusion of the formula for doppler frequency is an approximate one. And in a footnote he gives an exact expression for it. A reader will be unable to understand where he got it. It should be explained that such an expression is obtained by taking into consideration the correction which is known from the theory of relativity.

When speaking of passive interference (Page 6), the author does not explain why in obtaining conditions of resonance the length of the dipole is taken to be half the length of its wave. In discussing corner reflectors rather in detail he makes only fleeting mention of biconical reflectors and Luneberg lenses (Page 11). From the drawing which is given in the book it is easy to understand the principle of reflection of electromagnetic energy in a biconic reflector but it is not clear how to produce the reflection in a Luneberg lens. The reader may not understand why the angle of refraction of the beams changes inside the lens since the author gives no explanation of how it is done or with what. This information could have been presented if only by reducing the description given of corner reflectors which are generally understood. Many people do not understand the principle of operation of a Luneberg lens.

In explaining methods used for selection which are based on lateral effects of target movement (Page 39), the author indicates that "different parts of a target have dissimilar radial speeds of movement with respect to the radar." While this proposition is obvious for normal components of speeds, for radial components a somewhat more detailed description should have been given.

At times the author loses his sense of proportion and he presents information which is known to all. In our opinion there was no point in discussing the design and functioning of grid and diode limiters (Pages 193--202). This subject is described in detail in textbooks on pulse equipment.

Although there are certain shortcomings in the book being reviewed, it is of interest to a wide circle of readers. It will be especially useful for those who are engaged in operating such equipment.

PUBLISHING HOUSES AND EQUIPMENT IN 1967

* * *

Some of the largest publishing houses in our country such as "Izuka," "Znaniye," and "Energiya" plan to publish a large amount of literature in 1967. This literature will acquaint readers with how the decisions of the 23rd Congress of the CPU are being put into effect and will cover the most pressing scientific problems of the day. The brief abstracts published below will give an idea of the contents of several books and brochures which will be published in the coming year.

* * *

"Izuka"

Pandakov, V. I. Planning and Mastering the Production of New Goods. In the book the author discusses planning and mastering the production of new goods and untapped reserves for reducing the time needed to plan and manufacture new machines, mechanisms, and apparatuses and other equipment. He devotes a great deal of attention to the principles of planning scientific research and standardizing project-design work.

Zaydel', A. N. Elementary Evaluation of Measurement Errors. Second edition. The book is intended for people who desire to gain an acquaintance rapidly with modern theory of error and who do not have the apparatus necessary for mathematical analysis and the theory of probability. In the book there are presented tables necessary for determining confidence probabilities and intervals.

D'yachenko, V. F. and others. Controlling Communication Nets. The book is devoted to the pressing problem of automatic control in communication systems involving redistribution of information flows. In the book the author discusses the principles governing the design of control devices and centralized and decentralized methods for controlling communication nets.

Optical Emission Modulators. Extensive material concerning modulators is systematized and their properties, methods of modulation and trends in using modulators of visible and infrared emission are analyzed.

Sominskiy, K. S. Semi-conductors. The book amounts to a popular-scientific presentation of problems in one of the youngest fields of science -- the physics of semi-conductors. The author describes the physico-chemical properties of many competitive semi-conductor materials, methods for making and studying them, and all semi-conductor instruments which exist at the present time.

"Znaniye"

Ivanov, S. M. Man Among Automatic Devices. The reader will take a fascinating trip around laboratories where cosmonauts are trained, where cybernetic machines learn how to control plants, and where people learn how to control cybernetic machines. He will learn from the last chapters in the book about the science of evristika which is on the boundary between cybernetics and psychology.

Technical Aesthetics and Scientific Organization of Labor. Scientific organization of labor (NOT) is directly related to many problems and disciplines. One of the most important places among them is occupied by the young science of technical aesthetics. In the brochure the author discusses the tie between NOT and technical aesthetics, what achievements of technical aesthetics are being used today, and what tasks must be carried out by

specialists from the All-Union Scientific Research Institute of Technical Aesthetics and other organizations.

Alimov, I. A. and Kramskiy, G. I. Laser Detection and Communication. A thin beam of laser light emitted by a ruby rod or a gas mixture is acquiring new "professions" year after year. Scientists have already been able to cause a laser to function in the place of cumbersome, expensive, and very complex radars. The authors discuss the interesting and rapidly growing field of laser technology in this brochure.

Il'in, V. A. Telemechanics. Thanks to the rapid development of telemechanics it has become possible to adjust the trajectory of flight of space ships, get photos of the moon's surface, and to turn off and on generators of electric power plants which are "locked on" -- in a word to change the range and functioning of machines and mechanisms. From the book the reader will learn about the latest achievements of telemechanics and the role of electronics in creating telemechanical systems.

Kurbakov, K. I. Electronics in Standardization. "Made in keeping with the best world standards," is what is said today of very high quality machinery. In creating such equipment man receives a great deal of help from electronic information-search systems. They make it possible to automate information operations in large measure. In the brochure the author considers the main types of mechanized information-search systems.

Radio Electronics Today and Tomorrow. In prerevolutionary Russia there was not a single scientific research radiotechnical institute and radio equipment was delivered by foreign firms. At the present time in the USSR more radio specialists are trained than in any other country in the world and the radio-electronic industry has won world renown. This brochure will be read with interest by anyone who has traced the successes scored in radio electronics in our country and the main trends in the development of this branch of Soviet science.

Khlopov, Yu. N. Magnetron. In the brochure there is given a description of an electron tube which is new in principle and makes it possible to increase many times the "sensitivity" and "perceptivity" of radars. Thanks to the magnetron it has been possible to make radars which function in the centimeter and millimeter bands.

Complex Mechanization of Transloading Work in the Field of Transportation. In connection with the increase in the flow of cargo on our main lines of transportation and the need to reduce the cost of shipment, there has arisen an important new problem -- mechanizing transloading work. In the brochure the author discusses the methods and means used in this work.

New Soviet Motor Vehicles. Soviet motor vehicles are famed for their good quality, simplicity of operation, high roadability, and cargo capacity. The reader will learn from the brochure about new types of trucks and passenger cars made by Soviet engineers and designers.

"Energiya"

Planning High Frequency Channels for Electric Transmission Lines. The monograph will acquaint the readers with basic principles in planning high frequency channels for various purposes in electric transmission lines. Special chapters are devoted to methods for computing high frequency channels and selecting the optimal frequencies for them.

Karvovskiy, G. A. Protecting Electric Equipment Against the Effects of Surrounding Media. Models of electrical equipment are analyzed and recommendations are given for using this equipment in buildings and installations where the surrounding media differ. The author discusses the main conditions which lead to atmospheric and underground corrosion of conductor and structural metals.

Belotserkovets, V. V. Minor Mechanization in Electrical Installation Production. Second Edition. In the book there is a discussion not only of general purpose mechanisms and instruments used in electrical installation work but also of specialized mechanisms and instruments produced serially in plants and workshops.

Gayvalch, T. and others. Basic Electromechanical Calculations. Translation from the Slovak. Explanations of electrotechnical laws and examples of calculations to reinforce understanding of theoretical material are presented. The material is so presented that the reader moves from basic concepts and definitions to an explanation of complex processes and the operating principles of electrical machines and apparatuses.

Lipshteyn, L. A. and Shashnovich, M. I. Transformer Oil. Second edition. Composition, methods of production, and operational properties of transformer oils; additives for oils which increase their life; interaction of oil and hard materials used in transformers.

Silicon Rectifiers. From this monograph the reader will learn the theoretical bases of semiconductors and the operating principles, designs, characteristics, and parameters of silicon controlled, uncontrolled, symmetrical, and completely controlled rectifiers, stabiliztrons, and tunnel diodes.

Semiconductor Rectifiers. Set forth are the theoretical bases of semiconductor rectifiers, the design and characteristics of rectifying apparatuses which serve different purposes, and calculations of parameters and elements of rectifiers which use silicon valves. In the monograph recommendations are given for designing, selecting, and using rectifiers.

Karibskiy, V. V. and others. Technical Diagnosis of Controlled Objects. (Methods of analyzing continuous and discrete objects.) The general task of diagnosis which amounts to detecting any malfunction in a given list of malfunctions in a controlled device is formulated. Methods which make it possible in a pre-start check to use methods of logic for analyzing objects and arranging texts are analyzed.

Kasatkin, A. S. and Kuz'min, I. V. Evaluating the Effectiveness of Automatic Control Systems. In the book methods of optimizing and evaluating the effectiveness of automated control systems and also characteristics of objects and systems of control influence the value of effectiveness criteria are analyzed.

Lebedev, M. D. State and Development of Automatic Control Systems. An analysis is given of various classes of automatic control systems intended for checking operating ability and searching for malfunctions in automatic control systems and electronic apparatuses.

Yarpol'skiy, Zn. A. and others. Analog Tachometric Converters Using Magnetic Elements. Many questions related to the task of measuring and automating control of angular velocity in general industrial, transport, and other installations are taken up. The authors consider the theory and describe the circuits of instruments in the "Termopriber" unified system for controlling angular velocity which was developed by the Design Bureau.

Katsnel'son, B. V. and Larionov, A. S. Domestically Produced Radio Tubes and Their Foreign Counterparts. The reader will find in this reference book data about widely used domestically produced electronic and ion instruments, typical parameters and characteristics, and a description of several foreign counterpart tubes.

Reference Book on Semiconductor Diodes and Transistors. Second edition. Contents of the reference book: electrical parameters, limiting operational data and characteristics of domestically produced diodes and transistors which are manufactured by series production, and recommendations concerning general questions of design of reliable apparatuses using semiconductor instruments.

Reference Book on Radioelectronics. In two volumes. In the first volume there is information about the mathematical apparatus and theoretical basis of radioelectronics and the theoretical bases of radioelectronics, the theory of communication, propagation of radio waves, and radio antenna-feeder devices about semiconductor and electric vacuum devices. In the second volume information about radio broadcasting equipment and electronic acoustics and information about amplifying and radio receiving devices. Sections of the second volume include: pulse equipment, recording and producing electrical signals, radio measuring, television, and electric power for radio-electronic apparatuses.

Esterlin, K. S. Principal Malfunctions in Radio Measuring Apparatuses. This reference book will acquaint the reader with basic information about the most typical breakdowns encountered in the electronic radio measuring instruments now in general use. Recommendations are given for eliminating malfunctions.

Gladkov, A. S. and others. Soldering Parts of Electric Vacuum Instruments. In the book the authors analyze the results of research done on solders. They describe soldering regimes using various pairs of the metals and alloys used in making electric vacuum instruments. They describe the most reliable soldered joints and distinguishing features of the technology used to solder several of the subunits found in instruments.

Glozman, I. A. Radio Ceramics. Piezo ceramic materials, their properties and purposes; production of items made from the ceramic materials used to make piezo elements; applying electrodes to ceramic material; determining piezo electrical properties; and distinguishing features of piezo ceramic materials in modern equipment. Such is a list of subjects considered in this publication.

Kuz'min, V. A. and Senatorov, K. Ya. Four-layer Semiconductor Instruments. The authors consider the construction and operating principles of four-layer semiconductor instruments, their parameters, specifications, fields of application, and several circuits involving such instruments.

Rabkin, L. I. and others. Ferrites--Construction, Properties, and Technology of Production. In addition to a description of the various types of ferrites the authors take up the main questions involved in the technology of their production and also non-magnetic, soft magnetic, and hard magnetic ferrites.

Rayshel', T. and Iyedlichka, K. Photocathodes. Translation from the Czech. The authors discuss the mechanism of external photo effect and its main characteristics, methods of measuring parameters and characteristics of photocathodes, distinguishing features of the technology of using such cathodes, and fields of application.

Yankin, G. M. and Yablonskiy, F. K. Dekatrons. The authors give basic information about electric discharge in gas and consider the physical processes which take place in dekatrons (glow discharge tubes) and the operating principle and design of the main types of dekatrons.

Annual Publication of the Radio Amateur. Concerning the achievements in the field of radioelectronics, radiofication, and amateur radio activity during the year preceding publication.

Borisov, Ye. G. and Samodurov, D. V. Apparatus for Dubbing Sound on Amateur Films. Second edition. The book will acquaint the reader with matters involving the technique for dubbing sound on films and circuits. There is a description of home-made synchronizers for the most widely used film projectors and tape recorders.

Yefimov, Ye. I. Magnetic Heads. The author describes designs, parameters, and methods of testing the most widely used magnetic heads.

Korol'kov, V. G. and Lishin, L. G. Electrical Circuits of Tape Recorders. Second edition. An analysis is given of the recording amplifying and reproduction generator circuits for erasing and recording on magnetic tapes and commutation of the electrical circuits in modern tape recorders.

Mazo, Ya. A. Magnetic Tape. The author discusses the properties and parameters of modern magnetic tapes and gives recommendations for selection and use of them.

Gribanov, Yu. I. Radiotechnical Measurements. The author gives here basic information about the methods used for making radiotechnical measurements and the measuring instruments and devices used for this purpose. He also describes the circuits and designs of several measuring devices which he conceived and made.

Yerkin, A. M. Cold Cathode Tubes. The author analyzes the processes of gas conductivity and cold cathode emission. He considers the varieties and assortment of gas discharge tubes which are produced with a cold cathode and presents their basic characteristics, parameters, and their switch-on regimes.

Lomanovich, V. A. and Strizhevskiy, N. V. Chematron Instruments. The reader will become acquainted with the design operating principles, and field of application of new electronic instruments--chematrons. They amount to electrochemical counterparts of semiconductor instruments.

Malinin, R. V. Output Transformers. Second edition. In this publication you will find brief information about calculating and designing output transformers for transistor and tube terminal cascades which are used to amplify low frequencies in receivers, television sets, and other devices.

Katveyev, G. A. and Khomich, V. I. Ferrite Core Coils. Second edition. The authors set forth not only the basic properties of the magnetic materials used for making the cores of inductance coils but also recommendations about the selection of core designs and a method for calculating type inductance coils.

Tolmashkiy, I. S. High-Frequency Magnetic Materials. The properties and distinguishing features of high-frequency magnetic materials used in radiotechnical devices and recommendations concerning their use in designing radio apparatuses--such is the contents of this book.

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Dear Comrade Readers!

The editorial board and the editors of the magazine wish you great success during our Motherland's new, jubilee year in raising further the combat readiness of our glorious Armed Forces.

Happy New Year, dear friends!

** ** *

Answers to Questions Published in No. 11

1. The pump piston, in moving back and forth, changes its speed from zero to maximum. The water which it drives changes speed in the same way and as a result comes in gushes. The changing piston velocity causes the pressure of the water in the intake pipe to alternate between a high and a low as the water is regulated by the valve. The air chambers act as pressure regulators. When the speed of the pump is at a maximum the air in the chamber behind the force valve is compressed and the pressure in the pipes remains the same. When the speed of the piston is at zero the air, expanding, maintains the pressure in the main pipe. The air chamber located in front of the intake valve operates in the same way.

2. The greater the speed of the liquid moving in the pipe, the greater will be its kinetic energy. If its path is blocked rapidly (for example by a wedge-type slide valve) the pressure in the pipe will rise instantly and the pipe may burst. This phenomenon which is known by the name of hydraulic hammer was first studied by the Russian scientist N. Ye. Zhukovskiy who drew up a formula for the maximum increase of pressure occurring during water hammer. He showed that this pressure is proportional to the speed lost by the liquid when the hammer occurs. For example, in a steel water pipe a change in speed of only 1 m/sec will increase the pressure by 10 atm.

This is why the valves on a water pipe are closed gradually.

* * *

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